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THE

MECHANICS' MAGAZINE.

JULY 5TH—DECEMBER 27TH, 1856.

EDITED BY R. A. BROOMAN.

VOL. LXV.

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ROBERTSON, BROOMAN, AND CO.

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166, FLEET-STREET.

AGENTS:—*EDINBURGH*, J. SUTHERLAND; *GLASGOW*, W. R. M'PHUN, AND DAVID ROBERTSON; *DUBLIN*, HODGES AND SMITH, 104, GRAFTON-STREET; PARIS, A. & W. GALIGNANI, RUE *VIVIENNE*; *HAMBURGH*, W. CAMPBELL.

1856.

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Mechanics' Magazine.

No. 1717.] SATURDAY, JULY 5, 1856. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

HITT'S IMPROVEMENTS IN PROPELLING SHIPS AND IN TRANSMITTING MOTIVE POWER.

Fig. 1.

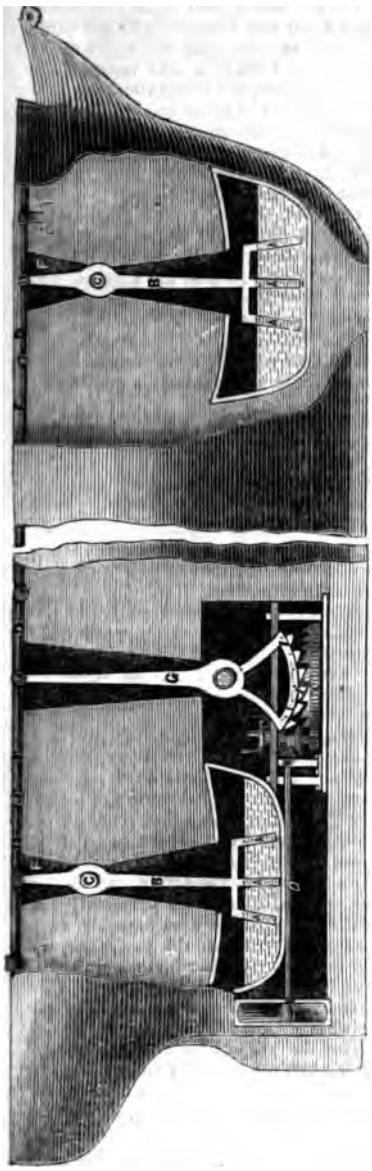


Fig. 3.

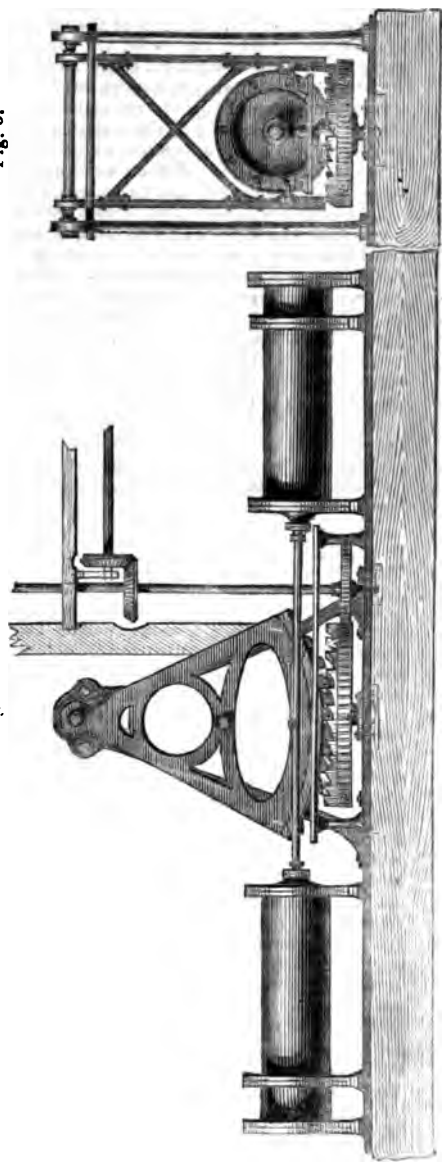


Fig. 2.

HITT'S IMPROVEMENTS IN PROPELLING SHIPS AND IN TRANSMITTING MOTIVE POWER.

MR. T. HITT, of Tavistock street, Westminster, has recently patented an invention which embraces a method of propelling vessels by means of the pitching action to which they are often subjected, and a method of transmitting power, which dispenses with the use of cranks, and is intended to produce continuous uniform motion.

The method of obtaining propelling power in vessels consists in the employment of two or more sets of vanes or blades mounted on an axis, and descending into tanks containing water at the fore and aft parts of the vessel, which tanks will not interfere with the cargo space of the vessel. The tanks are closed, and the vanes or blades, or the levers which carry them, are prolonged out of the tanks on the upper side of the axis, and terminate in a toothed quadrant or sector, which takes into a rack upon a shaft, this rack extending from one quadrant or set of quadrants at the bow to another quadrant or set of quadrants at the stern. By the pitching of the vessel an oscillating motion is communicated to the vanes, and from them to the quadrants, which in their turn cause the rack to move to and fro, and thus give motion to the shaft on which the rack is carried. The water in the tanks may be either fresh or salt, and may be increased or diminished in quantity at pleasure.

The machinery used in connection with this mode of obtaining motive power consists of a quadrant which gears into the rack before mentioned, and the foot of which is keyed or fixed to an arm on a cross head, which is free to oscillate in suitable bearings. To the cross head, and on each side thereof, is fixed a metal frame in the form of the segment of a circle. Around the bottom of each of these frames are fixed several pauls, their position on each plate being reversed. These pauls fall into and cause to rotate a ratchet wheel placed horizontally; the periphery of the ratchet wheel is toothed, and gears into other toothed wheels, the last wheel in the train being made to gear into and drive the shaft of a screw propeller. The two paul plates being caused to oscillate, communicate a continuous rotary motion to the screw propeller shaft.

Instead of employing racks and toothed quadrants, as described, the patentee sometimes prefers to substitute for the racks a longitudinal rod, and to connect the vanes or blades to levers, the other ends of which are connected to the longitudinal rod by means of suitable links, the arm on the cross head being connected to the longitudinal rod in the same manner.

The mode of obtaining power may be used with other propelling machinery or for any other purpose on board ships. The machinery before described in connection with a screw propeller, may be used in connection with any other description of motive power or propelling agent, and for any purpose to which motive power is applicable.

Fig. 1 of the engravings on the preceding page represents a longitudinal section of the fore and aft portions of a vessel to which both parts of Mr. Hitt's invention are applied. In this case he has adopted the longitudinal rod and connecting links instead of the racks and quadrants. A A are the vanes or blades, which are carried by levers, B B, mounted on axes, C C. The upper ends of the levers, B B, are connected by the links, D D, to the longitudinal rod, E, which extends from the fore part to the after part of the vessel when two or more sets of vanes or blades are employed, and is supported by suitable intermediate bearings. F F are tapered spaces, cut away for the purpose of allowing the levers, B B, to oscillate freely. It will now be seen that by the pitching of the vessel an oscillating motion will be communicated to the vanes or blades, A A, and from them to the levers, B B, which in their turn cause the rod, E, to move to and fro. G is a lever, which is connected by another link, D′, to the rod, E, and receives a rocking motion from it. It is this lever, G, which gives motion to the propelling apparatus shown in part in fig. 1. This apparatus is shown on a larger scale in figs. 2 and 3, fig. 2 being a longitudinal elevation, and fig. 3 a transverse view of the same. In these figs., however, motion is imparted originally, not from the lever, G, as it would be where both parts of the invention are used together, as in fig. 1, but from a steam engine, H. I I are the metal plates to which the pauls, J J, are attached, the pauls on one plate inclining forward and those on the other inclining aft. K is the ratchet wheel, into which the pauls, J J, fall, and which is rotated by them. This wheel, K, has teeth, L L, formed upon its periphery, and these teeth gear into those of the wheel, M, which drive the axle, N, which carries the wheels, O and O′. The teeth of one of these wheels, O O′, take into those of the wheel, P, on the propeller shaft, Q, when the vessel is to be propelled forward, and those of the other when the vessel is to be propelled backward. Thus, when the paul plates, I I, are caused to oscillate, a continuous rotary motion is imparted to the shaft, Q, by means of the pauls, J J, and the wheels, K, M, and O, or O′.

The patentee does not confine himself either to the number of the plates which carry the

pauls, or to the number of sets of pauls, or to the number of gearing wheels before described; nor does he restrict the application of the improved machinery to the propulsion of ships or other vessels only, but proposes to employ it wherever it is necessary to convert reciprocating motion into rotary motion either on land or sea.

THE ENGLISH AND AMERICAN PATENT OFFICES.

Whilst the diplomatists of England and America have been quarrelling, the officers who preside over the patent offices of the two countries have been interchanging compliments and favours, in the friendly spirit which prevails, and which must continue to prevail, among the scientific men of the two countries.

It is easy to observe that the numerous and enlightened changes which have recently been made in the patent department of this country, have had an important influence in America. This may be particularly observed in the documents from time to time published by the Hon. C. Mason, the American Commissioner of Patents — documents which display in a remarkable manner the enlarged views and liberal tendencies of that gentleman. In his last report, for example, he speaks with great force and clearness against the American system of making the granting or the withholding of a patent to depend upon the dictum of an examiner, and also against the existing exaction at the American office of heavy fees from foreign inventors. In allusion to the first, he says, "All our republican notions of propriety revolt at the idea of making the substantial rights of property of any citizen depend upon the mere discretion of an executive officer. Such a system seems rather Asiatic than Anglo-Saxon in its type and origin. The present patent laws are certainly, to some extent, liable to this objection." And in regard to the second, he says, "It seems desirable that every case should, as nearly as practicable, be taxed with the expenses it occasions, but no more. This rule might easily be much more strictly observed than it is at present. The most signal departure from it is seen in the exorbitant fees demanded of foreign applicants. Where the citizen or immigrant alien pays a fee of thirty dollars, the subject of the Queen of Great Britain, who resides at home, is obliged to pay five hundred. And yet the application of the latter occasions no more trouble than that of the former."

It appears probable, also, that the practice of officially printing the specifications of all the patents granted in this country, which is so highly appreciated by our manufacturing and commercial classes, will before long be imitated in America. The subject has already been brought under the notice of the American Government, in a letter to the Hon. James Buchanan, which accompanied a present of books made by the Commissioners of Patents here to the American Commissioner. This letter was written by Mr. Bennet Woodcroft, and contains the following remarks, which will doubtless receive in America the careful attention they deserve:

"I find," he says, "that universal satisfaction and benefit are derived by printing the specifications, with outline drawings of the full size, and selling them at prime cost to individuals, as well as presenting complete sets of copies to all the free libraries in Great Britain. Heretofore it seemed a hardship that whilst the law presumed that all inventors are acquainted with what had previously been done, yet that they were left in a state of ignorance from the want of publicity being given to specifications. Hence the same invention was frequently made by different persons, and as often patented.

"If this evil should again occur, it will, in this country, be the fault of the patentee."

It is worthy of remark, that the system of printing the specifications of patents, which was at first viewed with apprehension by some, and discountenanced by many, has already proved, as Mr. Woodcroft says, to the public advantage. This is shown, not merely by the approbation which it meets in foreign countries which have not yet proceeded so far as to adopt it, but also by statistical facts which will probably be shortly published, and which show that in our large towns the number of patents applied for is increasing, in proportion as facilities are afforded for examining the inventions for which patents have been previously granted. This result, however much it may differ from what some may have anticipated, is not in itself surprising, inasmuch as an exact and ample knowledge of what has already been effected, is more stimulative to the inventive faculties of most men, than ignorance can possibly be. For our own part, we shall not be surprised to find that the publicity given to the specifications of patents has the further effect of raising the character of the inventions for which the protection of patents are sought.

It is highly gratifying to find that the

kingdom of Sardinia, just now conspicuous for its sagacity and wisdom, has followed the example of England in this respect, and in the patent law of March 12, 1855, has provided for the full publication of all the specifications of patents.

In reference to the present of books above mentioned, the Washington *Daily National Intelligencer*, has, from the *Union*, the following observations:

"A few days since these books arrived, numbering upwards of two hundred volumes; of which there are ninety-three large folio volumes of drawings, all neatly mounted upon cloth; the same number of volumes of specifications; fourteen volumes of indices, prepared by Assistant Commissioner Woodcroft himself; and the two first volumes of the Commissioners of Patents Journal for 1854 and 1855.

"It having been suggested that the binding of these works could be executed in the best manner and at the least expense in London, and Professor Woodcroft having kindly volunteered to superintend the execution of the work, the United States Patent Office assented to this view, and these works have accordingly been bound in a durable and elegant manner, which reflects the highest credit on the workmen, and promises to preserve these valuable records for a long time to come.

"To show the amicable feeling existing between the two departments, we state that, in order to forward the books designed to be presented to this government as soon as possible, the British Commissioners kindly dispatched those which had been finished for their office; otherwise a delay of two months in the reception of these books would have been caused."

PETITJEAN'S PROCESS FOR SILVERING GLASS.

BY PROFESSOR FARADAY, D.C.L., F.R.S.

M. PETITJEAN'S process consists essentially in the preparation of a solution containing oxide of silver, ammonia, nitric, and tartaric acids, able to deposit metallic silver either at common or somewhat elevated temperatures; and in the right application of this solution to glass, either in the form of plates or vessels. 1540 grains of nitrate of silver being treated with 955 grains of strong solution of ammonia, and afterwards with 7,700 grains of water, yields a solution, to which when clear 170 grains of tartaric acid dissolved in 680 grains of water is to be added, and then 152 cubic inches more of water, with good agitation. *When the liquid has* settled, the clear part is to be poured off; 152 cubic inches of water to be added to the remaining solid matter, that as much may be dissolved as possible; and the clear fluids to be put together and increased by the further addition of 61 cubic inches of water. This is the silvering solution, No. 1; a second fluid, No. 2, is to be prepared in like manner, with this difference, that the tartaric acid is to be doubled in quantity. The apparatus employed for the silvering of glass plate consists of a cast-iron table box, containing water within, and a set of gas-burners beneath to heat it: the upper surface of the table is planed and set truly horizontal by a level, and covered by a varnished cloth: heat is applied until the temperature is 140° Fahr. The glass is well cleaned, first with a cloth; after which a plug of cotton, dipped in the silvering fluid and a little polishing powder, is carefully passed over the surface to be silvered, and when this application is dry it is removed by another plug of cotton, and the plate obtained perfectly clean. The glass is then laid on the table, a portion of the silvering fluid poured on to the surface, and this spread carefully over every part by a cylinder of India-rubber stretched upon wood which has previously been cleaned and wetted with the solution; in this manner a perfect wetting of the surface is obtained, and all air bubbles, &c., are removed. Then more fluid is poured on to the glass until it is covered with a layer about the $\frac{1}{10}$ of an inch in depth, which easily stands upon it; and in that state its temperature is allowed to rise. In about ten minutes or more silver begins to deposit on the glass, and in fifteen or twenty minutes a uniform opaque coat, having a greyish tint on the upper surface, is deposited. After a certain time the glass employed in the illustration was pushed to the edge of the table, was tilted that the fluid might be poured off, was washed with water, and then was examined. The under surface presented a perfectly brilliant metallic plate of high reflective power, as high as any that silver can attain to; and the coat of silver, though thin, was so strong as to sustain handling, and so firm as to bear polishing on the back to any degree, by rubbing with the hand and polishing powder. The usual course in practice, however, is, when the first stratum of fluid is exhausted, to remove it, and apply a layer of No. 2 solution; and when that has been removed and the glass washed and dried, to cover the back surface with a protective coat of black varnish. When the form of the glass varies, simple expedients are employed; and by their means either concave or convex, or corrugated surfaces are sil-

vered, and bottles and vases are coated internally. It is easy to mend an injury in the silvering of a plate, and two or three cases of repair were performed on the table.

The proposed advantages of the process are,—the production of a perfect reflecting surface; the ability to repair; the mercantile economy of the process (the silver in a square yard of surface is worth 1*s.* 8*d.*); the certainty, simplicity, and quickness of the operation; and, above all, the dismissal of the use of mercury. In theory the principles of the process justify the expectations, and in practice nothing as yet has occurred which is counter to them.*

ON THE CONSTRUCTION OF BOOTS AND SHOES.

BY A CORRESPONDENT.

THIS may seem an odd subject on which to offer any suggestions; but, while there are several treatises on shoeing a horse, I have never met with any rational observations on the best method of shoeing a man.

I have lately read that, when an army is on a march, great numbers of men fall out of their ranks owing to the torture occasioned by their shoes; and it is too plainly to be seen that the feet of many persons are monstrous owing to the corns, bunnions, and distorted toes, chiefly caused by their shoes. Then, under this unnatural pressure of the shoes, the circulation is obstructed, causing cold feet, chilblains, and other evils, all tending to injure the general health.

Having had much to do in mechanical matters, I have often had occasion to notice that excellence frequently consists in what may be called small differences.

In long walks, and particularly in going over rough ground in surveying, I used to suffer so much in consequence of the manner in which shoes are usually formed, that I was compelled to apply my own common sense to the question; and I did this with so much success that, for these twenty years past, my feet have had perfect ease, and are in as good order as my hands.

Then, as a mere money question, I save considerably, owing to the greater time a properly constructed shoe will last.

In the annexed sketch the thick line in fig. 1 represents a sole as generally cut, and the thin lines show my departures from that cut.

Fig. 1.

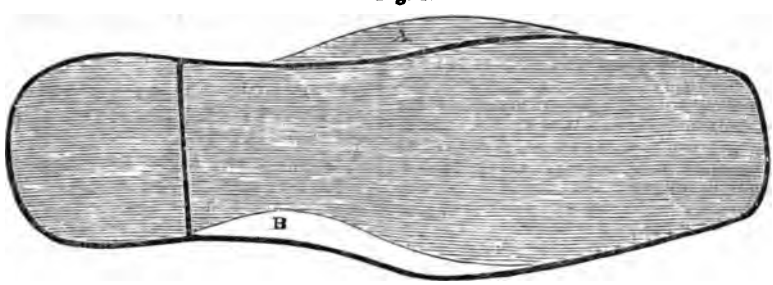
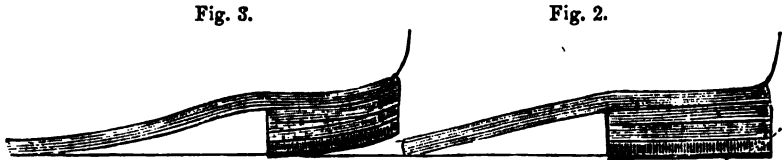


Fig. 3. Fig. 2.



The difference between the two cuts may be described by saying, that mine is *plus* the portion A and *minus* the portion B. So then, by taking a common pair of right and left lasts, and adding at A and cutting away at B, as shown, the form recommended will be obtained.

But it is just that small portion, A, that saves the foot, and B is *worse than mere* waste; for ease depends more on the exact fit than the room. The shoe should *touch* the foot in every part except at the toe, so as not to shift about. A shoe cut as suggested holds the foot in position by an

* The above description by Professor Faraday of M. Petitjean's process, for which a patent was recently obtained in this country, formed part of a lecture recently delivered at the Royal Institution.

equally-distributed pressure, gives steadiness, and saves it from being crumpled up and thrust forward against the toe-end of the shoe.

Then I also copy nature in forming the heel, by making it at first of the form that it will assume after some little wear.

The heel is usually made with the courses of leather horizontal, or flat on the ground, as shown in fig. 2.

But, after a little wear, the heel becomes worn away at the lower part behind, and leaves the heel in the form shown above the dotted line, that dotted line being a curve, of which the hip-joint is the centre. In this state the heel, instead of being a solid block, is ragged, unsightly, and soon drops to pieces.

Taking this hint from nature, I make the heel as shown in fig. 3; in which it will be noticed that a wedge-piece is introduced, and the heel worked at first into the form that it would very soon assume. But by this artifice I secure the lower course, whether of leather or of iron, whole to the last, instead of being prematurely broken and ragged.

S. B. H.

Chelsea, June 25, 1856.

HART'S THRESHING AND DRESSING MACHINES.

THE following is a description of the improvements in threshing and dressing machines for which provisional protection was obtained in November last by Mr. Charles Hart, of Wantage, Berkshire, to whose improvements in agricultural apparatus Mr. Baddeley directed the attention of our readers in our number for April 5, of this year, (No. 1704.)

These improvements relate—Firstly, To a method of constructing the drum of threshing machines, by forming a cylinder with eight or other convenient number of beating blocks or bars arranged around its periphery. On the outer surface of these bars a series of grooves or indents are cut in a spiral direction from end to end. A strong metal wire is then coiled round the drum in the indents or grooves in a continuous spiral, by which means the beater blocks are secured and bound strongly together. Metal beaters of an inclined form are then mounted upon the beater bars. The highest part of the beater being placed at the back, the corn is first acted upon by the edges of the beater bars, next by the lowest edges of the beaters; and, finally, by the highest edges thereof, producing more perfect work with less injury to the corn than heretofore. *Secondly*, In the addition to threshing and dressing machines, whether portable or fixed, of a separating apparatus containing a revolving fan and archimedean sieve placed on either side of the machine, through which the corn, after being threshed, dressed, and delivered in the ordinary way, is caused to pass. For this purpose the corn is elevated by a chain of buckets into a hummeller, along which it is urged by a horizontal revolving shaft, equipped with projecting arms placed in an inclined direction. On issuing from the hummeller, it falls upon a dividing plate, and is subjected to the action of a fan-blower, which effectually removes any chaff that may have passed over from the first dressing. The corn then falls into a horizontal cylindrical sieve, to the inner surface of which is affixed a helix. A revolving motion being given to this cylindrical sieve, the helix causes the corn to advance, and pass over every portion of the sieve. The sieve covering is divided lengthwise into three or more compartments, each one having larger meshes than the preceding. In consequence of this arrangement, the corn becomes separated into five portions, namely, blighted and defective corn, small seeds, and rubbish tail (or small) wheat, best wheat, and husks, which escape at the end of the cylinder. These separate products pass out at spouts placed at the side of the machine, and may be received in sacks properly placed for their reception.

CLIFFORD'S METHOD OF INSTANTLY LOWERING SHIPS' BOATS AT SEA.

INSTRUCTIONS having been forwarded a short time since by the Admiralty to the superintendent of transport shipping at Woolwich, directing his personal inspection of Mr. Clifford's apparatus for lowering instantly and safely ship's boats, and requesting his report thereon, with a view of introducing the system into general use,* we are happy to find that "the report in question has been so satisfactory that the Lords Commissioners of the Admiralty have ordered a line-of-battle-ship and a steamer to be fitted therewith for trial immediately." It is to be hoped, therefore, that this plan, the adoption of which has been already made compulsory by the Emigration Commissioners in all vessels chartered by them, will be proved equally effective in the Navy, and that a simple remedy may at last have been found for this "national evil."†

* See *Times*, June 5, "Naval Intelligence."

† For a description of Mr. Clifford's apparatus, see *Mech. Mag.*, vol. lix., p. 334, and vol. lxii., p. 492.

FOREIGN INTELLIGENCE.

Scientific, Engineering, Architectural, &c.

BERLIN. — ZINCOPLASTIC. — This novel branch of architecture and general ornamentation has now been raised to a high degree of perfection. Messrs. Devaranne, Geiss, and Lippold, possess the largest establishment in the Prussian capital. Zincoplastic has the advantage, that the finest art-forms can be reproduced by it most faithfully; and by the aid of the electro-galvanic process, even the natural colour of bronze can be imparted to them.

PARIS. — METEOROLOGY. — The electric lines now spread, with perfect system over the length and breadth of this vast empire, have made it possible that, during the late inundations, the state of the atmosphere could be ascertained in any part of France at any given time. All these notices converged at the observatory of Paris, and were communicated to the Academy of Sciences, &c.

GERMANY. — PESTALOZZIAN INSTITUTION.—EDUCATION BY WORK.—The Pestalozzian Institutions of Prussia have put forth the great principle of education for work-efficiency (*Arbeits-Tüchtigkeit*) from early youth. The programmes detail the means they intend to pursue for the accomplishment of this great purpose of the times, which aims at the health and vigour of youth, and makes them cherish that work in which their whole existence is to be consumed.

ROME.—The Pope has decided that an exhibition of articles of rough silk should take place next autumn. This is the only article of active commerce which the Roman States possess at present, as all the silk produced is exported to France and Tuscany to be coloured, &c.

EXTENSION OF THE DRAINAGE SYSTEM OVER EUROPE.—This great invention of agricultural science proceeds everywhere. In Prussia machines have been distributed gratuitously, instructions printed, &c. In France, the Government have granted a loan of 100,000,000 francs towards the making of drains all over the land. This sum is to be advanced to agriculturists under very favourable conditions.

[*Communicated by* DR. J. LOTSKY.]

A Catechism of the Steam Engine in its various application to Mines, Mills, Steam Navigation, Railways, and Agriculture; with Practical Instructions for the Manufacture and Management of Engines of every Class. By JOHN BOURNE, C.E. Fourth Edition, greatly enlarged and improved, and illustrated by eighty-nine Wood Engravings. London: Longman, Brown, and Co. 1856.

This is a title-page which, if not of much promise, at least promises much. The preface to this fourth edition also promises very much for the book to which it is attached; we think too much,—more indeed than we expect to see accomplished in any book that comes before us. But as it is desirable to know what the author of the work thinks of his own performance, we will set some portions of Mr. Bourne's preface before our readers. He says:

"For some years past a new edition of this work has been called for, but I was unwilling to allow a new edition to go forth with all the original faults upon its head; and I have been too much engaged in the practical construction of steam ships and steam engines to find time for the thorough revision which I knew the work required. At length, however, I have sufficiently disengaged myself from those onerous pursuits to accomplish this necessary revision," [Does Mr. Bourne mean that he has given up his professional employment in order to do this public service?] "and I now offer the work to the public, with the confidence that it will be found better deserving of the favourable acceptation and high praise it has already received. There are very few errors, either of fact or of inference, in the early editions which I have had to correct; but there are many omissions which I have had to supply, and faults of arrangement and classification which I have had to rectify. I have also had to bring the information, which the work professes to afford, up to the present time, so as to comprehend the latest improvements.

"For the sake of greater distinctness, the work is now divided into chapters. Some of these chapters are altogether new, and the rest have received such extensive additions and improvements as to make the book almost a new one. One purpose of my emendations has been to render my remarks intelligible to a tyro, as well as instructive to an advanced student. With this view I have devoted the first chapter to a popular description of the steam engine, which all may understand who can understand anything; and in the subsequent gradations of progress I have been careful to set no object before the reader for the first time of which the nature and functions are not simultaneously explained. The design I have proposed to myself in the composition of this work is to take a young lad, who knows nothing of steam engines, and to lead him, by easy advances, up to the highest point of information I have myself attained; and it has been a pleasing duty to me to smooth for others the path which I myself found so rugged, and to impart, for the general good of mankind, the secrets which others have guarded with so much jealousy. I believe I am the first

author who has communicated that practical information respecting the steam engine, which persons proposing to follow the business of an engineer desire to possess. My business has, therefore, been the rough business of a pioneer; and while hewing a road through the trackless forest, along which all might hereafter travel with ease, I had no time to attend to those minute graces of composition and petty perfections of arrangement and collocation which are the attribute of the academic grove or the literary parterre. I am, nevertheless, not insensible to the advantages of method and clear arrangement in any work professing to instruct mankind in the principles and practice of any art; and many of the changes introduced in the present edition of the work are designed to render it less exceptionable in this respect."

We are glad Mr. Bourne is not *altogether* "insensible to the advantages of method and clear arrangement," as we regard these as the first necessities in any book which is intended to be understood by its readers; and we should, indeed, have thought that when Mr. Bourne proposed to himself to conduct his ignorant "young lad" up to the highest point of information he has himself attained, he would also have proposed to himself, as a means to this "difficultly-to-be-obtained" object, to make the arrangements of his work wholly unexceptionable. But it is in this necessary quality of a good book that Mr. Bourne's work is mainly wanting. Indeed, why make it a catechism at all? This form of composition is adapted only to books, the contents of which are intended for very young pupils to get by heart, in which case the questions, with their accompanying answers, are designed to assist the memory of the pupil by means of the association of the *mere terms* in which they are couched. The teacher, in examining the pupil, proposes the set questions, the very sound of which is associated in the mind of the pupil with the sounds in which the proper answer is expressed. There are two other minor advantages which this form of composition may, perhaps, be supposed to possess. The questions, if well constructed, will arrange the matter of the composition into convenient sections, and enable the pupil or the reader better to direct his attention to the mastering of each particular point, so as to make it his own. And, lastly, the question will serve as a title to the material of which its answer is composed,—as an index to the subject treated of in that part of the book.

The first of these three properties of the catechetical form is quite out of the question in the present book, and the objects *of the last two are all that can be supposed, by Mr. Bourne himself, to be gained* by the adoption of this form. These, however, may be secured in a much more economical, and also much more effective manner, simply by the use of paragraphs with suitable headings, somewhat after the style of Lardner's "Handbook of Natural Philosophy." We will give an extract or two from Mr. Bourne's book which will illustrate our meaning, and show the justice of what we advance. After reading in the preface, that the author has "been careful to set no object before the reader, for the first time, of which the nature and functions are not simultaneously explained," the reader will be somewhat surprised to find that the book commences with an exposition of the "Mechanical Principles of the Steam Engines," in which he is presupposed to be acquainted with the "nature and functions" of the principal parts of that machine, the knowledge of which he is told he may acquire by easy and progressive stages.

We extract the first two questions and their answers:

"1. *Q.* What is meant by a vacuum?

"*A.* A vacuum means an empty space; a space in which there is neither water, nor air, nor anything else that we know of.

"2. *Q.* Wherein does a high pressure differ from a low pressure engine?

"*A.* In a high pressure engine, the steam, after having pushed the piston to the end of the stroke, escapes into the atmosphere, and the impelling force is, therefore, that due to the difference between the pressure of the steam, and the pressure of the atmosphere. In the condensing engine the steam, after having pressed the piston to the end of the stroke, passes into the condenser, in which a vacuum is maintained, and the impelling force is that due to the difference between the pressure of the steam above the piston, and the pressure of the vacuum beneath it, which is nothing; or, in other words, you have then the whole pressure of the steam urging the piston, consisting of the pressure shown by the safety-valve on the boiler, and the pressure of the atmosphere besides."

Now, not to mention the inaccuracy of the above, we venture to say that Mr. Bourne's ignorant lad would by no means comprehend a bit of it. No one, in fact, could understand the first sentence in the second answer who did not know what sort of thing the piston of a steam engine is, and also the mode in which it moves to and fro in the cylinder; that is, who did not previously understand the general action and character of the steam engine; and this also presupposes a knowledge of the general principles of pneumatics. The second sentence of the same answer is like unto it, with the addition that, the pupil is supposed to be acquainted with the nature and functions of the safety-valve, for he is sup-

posed to know that the pressure indicated by this valve, is the difference between the pressure of the steam within the boiler and that of the atmosphere without it.

Questions 3, 4, 5, give a very defective classification of engines, the reader being supposed to have a familiar acquaintance with such words as cylinder, rotatory engine, crank, air-pump, &c. Next we have the "nature and uses of a vacuum" treated upon. The following is supposed to complete the theory of the vacuum.

"14. *Q.* With what velocity does air rush into a vacuum?"

"*A.* With the velocity which a body would acquire by falling from the height of a homogeneous atmosphere, which is an atmosphere of the same density throughout, as at the earth's surface; and although such an atmosphere does not exist in nature, its existence is supposed, in order to facilitate the computation. It is well known that the velocity with which water issues from a cistern is the same that would be acquired by a body falling from the level of the head to the level of the issuing point; which indeed is an obvious law, since every particle of water descends and issues by virtue of its gravity, and is in its descent subject to the ordinary laws of falling bodies. Air rushing into a vacuum is only another example of the same general principle; the velocity of each particle will be that due to the height of the column of air which would produce the pressure sustained; and the weight of air being known, as well as the pressure it exerts at the earth's surface, it becomes easy to tell what height a column of air an inch square, and of the atmospheric density, would require to be to weigh 15 lbs. The height would be 27,818 feet, and the velocity which the fall of a body from such a height produces would be 1,338 feet per second."

We cannot help wondering what Mr. Bourne's ignorant lad will make of the assertion that it is an *obvious* law that fluids should rush into a vacuum with a velocity due to the height of a homogeneous column whose weight equals the pressure of the fluid at the orifice through which it escapes into the vacuum. We have been in the habit of thinking that this law has been established, in so far as it is true, by experiments and investigations of some length and difficulty. Mr. Bourne's, however, is a very short and easy method, and would certainly be preferred if it were reliable. For our part, we do not see the *direct* connection between a body falling in a vacuum through a given height, and the descent of a particle of a fluid from the same height above the orifice at which we may suppose it to be escaping. If each particle of a fluid *in descending* be subject in the way above indicated by Mr. Bourne to the ordinary laws of falling bodies, how is it that in a fluid which is not homogeneous, each particle does not issue from the orifice with the velocity which it would acquire in falling from the surface to the orifice? And why is it necessary to suppose the existence of a homogenous atmosphere? It is, of course, because the pressure and the density of the fluid in the neighbourhood of the orifice determines the velocity of issue, and these have a very obvious and direct relation with the height and density of a homogeneous column, so that it might be pretty plain that the velocity of escape would have a fixed relation to the height of this column; but we do not think it at all plain that this relation is the actual one, until we learn by independent means what is the relation between the velocity, the pressure, and the density. Another feature in this kind of fluid motion that makes us hesitate to adopt Mr. Bourne's method of arriving at it is, that, in a cistern of water, emptied, suppose, by means of a small orifice in the bottom, those particles of the fluid which issue with the greatest velocity, are those which actually descend through the least space, for as the surface of the water lowers, the velocity of the escaping stream diminishes, and becomes smallest generally when the particles which have fallen farthest reach the orifice and get their turn to depart. So that generally, in a case of this kind some features of the laws of falling bodies are reversed, since those which descend through the least distance have the greatest velocity, and *vice versâ*. It is an easy matter to deduce a known law from any premises in any manner, because it is always safe to get a conclusion of the correctness of which we have independent assurance.

We observe in the above, that the velocity of an issuing fluid is referred to that acquired by a body falling under the action of gravity. In the next section the terms here employed are explained, and their relations set forth. This is a minor instance of inverted arrangement.

On page 14, when calculating the centrifugal force of the half of a fly-wheel, in order to find the tensile strain upon the rim, the velocity of the revolving mass and the radius are both taken to be those of the rim itself, when they should be those belonging to the centre of gravity of the semi-wheel. The problem is to find the velocity of the wheel when the centrifugal force would cause fracture. The section of the rim is supposed to be one square inch, and at the two opposite points of attachment of one half to the other is to be capable of sustaining a tensile strain of 30,000 lbs., and the

weight of the half rim is about 50 lbs. The expression for centrifugal force of a body whose centre of gravity is revolving with a velocity v in a circle whose radius is r is

$$\frac{W}{g}\ \frac{v^2}{r},$$

g being the accelerating force of gravity.

Now, the wheel in question has a diameter of 10 feet, or radius of 5 feet; and therefore the centre of gravity of the semi-rim would be about 3 feet from the centre of the wheel; so that $r=3$, and if we make $V=$ the velocity of the rim, we get the equation,

$$\frac{9}{25}\ \frac{W}{g}\ \frac{V^2}{3} = 30{,}000;$$

or approximately,

$$\frac{3}{25} \cdot \frac{50}{32} \cdot V^2 = 30{,}000,$$

$$\frac{6}{32} V^2 = 30{,}000,$$

$$V^2 = 160{,}000,$$

$$V = 400,$$

instead of 312, which is Mr. Bourne's result.

The next paragraphs contain the same error.

On page 16, we have a definition of the "centre of gyration;" though no such point generally exists. There is a radius, but no centre, of gyration.

On page 27, the friction of a machine is confounded with the work due to friction in any proposed time—two essentially distinct things. Mr. Bourne says, "the friction, therefore, of my machine varies as the velocity, though the friction per revolution remains at all ordinary velocities the same."

Relating to the greater amount of deflection which a force produces in a beam when suddenly applied, than when the same force is gradually applied, we have the following:

"74. *Q.* What will be the amount of increased strain consequent on deflection?

"*A.* The momentum of any moving body being proportional to the square of its velocity, it follows, that the strain will be proportional to the square of the amount of deflection produced in a specified time."

The argument here would not be very safe, even if the premises were true; but in this case both are defective, as those who understand dynamics will perceive.

We meet with remarkable definitions in this book. Here is one of specific heat. "By specific heat I understand the relative quantities of heat in bodies of the same weight, just as by specific gravity, I understand the relative quantities of matter in *bodies of the same bulk. Equal weights* of quicksilver and water at the same temperature do not contain the same quantities of heat, any more than equal bulks of those liquids contain the same quantities of matter. The absolute quantity of heat in any body is not known, but the relative heat of bodies at the same temperature, or, in other words, their specific heats, have been ascertained and arranged in tables, the specific heat of water being taken as unity."

Thus the specific heat of a body is determined, according to Mr. Bourne, by the ratio of two quantities which we do not know, and which we have no means of discovering. As to how the relation of these two unknowns is estimated, Mr. Bourne gives us no clue.

Page 90 affords us a definition of combustion. "Combustion is nothing more than an energetic chemical combination; or, in other words, it is the mutual neutralization of opposing electricities." We expect that the hypothetical ignorant lad will not be able to form a very definite idea of combustion from such a definition. In connection with this subject we find Mr. Bourne making small account of Mr. C. Wye Williams's method of securing perfect combustion, while Prideaux's method is represented, not as being of much excellence, but as being free from the objections which Mr. Bourne seems to think lie against that of Mr. Williams. We think it would have been better for him to have reserved the judgment which his statements imply, unless he could give some ground for it. It may be, however, that Mr. Prideaux's furnace holds a very prominent position in this work, because a couple of showy wood-cuts, illustrative of it, were at hand when the parts of the book were put together.

We pass over many pages of really very useful information, though, as we have before said, somewhat heterogeneously arranged, and containing rules for the computations of various parts of boilers and engines which are not very easy of comprehension, of which little or no explanation is given, and in which we remark some curious expressions, such as "square root of an exhaustion." We quote the following on boiler explosions, though not, as in the case of most of our previous extracts, to condemn it, but as a favourable specimen of the matter of the book.

"306. *Q.* What is the chief cause of boiler explosions?

"*A.* The chief cause of boiler explosions is undoubtedly too great a pressure of steam, or an insufficient strength of boiler" [very much the same, we suppose]; "but many explosions have also arisen from the flues having become red hot. If the safety-valve of the boiler be accidentally jammed,

or if the plates or stays be much worn by corrosion, while a high pressure of steam is nevertheless maintained, the boiler necessarily bursts; and if, from an insufficiency of water in the boiler, or from any other cause, the flues become highly heated, they may be forced down by the pressure of the steam, and a partial explosion may be the result. The worst explosion is where the shell of the boiler bursts; but the collapse of a furnace or flue is also very disastrous generally to the persons in the engine room; and sometimes the shell bursts and the flues collapse at the same time; for if the flues get red hot, and water be thrown upon them either by the feed-pumps or otherwise, the generation of steam may be too rapid for the safety-valve to permit its escape with sufficient facility, and the shell of the boiler may in consequence be rent asunder. Sometimes the iron of the flues becomes highly heated, in consequence of the improper configuration of the parts which, by retaining the steam in contact with the metal, prevents the access of the water. The bottoms of large flues, upon which the flame beats down, are very liable to injury from this cause; and the iron of flues thus acted upon may be so softened that the flues will collapse upward with the pressure of the steam. The flues of boilers may also become red hot in some parts, from the attachment of scale, which, from its imperfect conducting power, will cause the iron to be unduly heated; and if the scale be accidentally detached, a partial explosion may occur in consequence.

"307. *Q.* Does the contact of water with heated metal occasion an instantaneous generation of steam?

"*A.* It is found that a sudden disengagement of steam does not immediately follow the contact of water with the hot metal; for water thrown upon red hot iron is not immediately converted into steam, but assumes the spheroidal form, and rolls about in globules over the surface. These globules, however high the temperature of the metal may be on which they are placed, never rise above the temperature of 205°, and give off but very little steam; but if the temperature of the metal be lowered, the water ceases to retain the spheroidal form, and comes into intimate contact with the metal, whereby a rapid disengagement of steam takes place. If water be poured into a very hot copper flask, the flask may be corked up, as there will be scarce any steam produced so long as the high temperature is maintained; but so soon as the temperature is suffered to fall below 350° or 400°, the spheroidal condition being no longer maintainable, steam is generated with rapidity, and the cork *will be projected* from the mouth of the flask with great force.

"308. *Q.* What precautions can be taken to prevent boiler explosions?

"*A.* One useful precaution against the explosion of steam boilers from too great internal pressure, consists in the application of a steam gauge to each boiler, which will make the existence of any undue pressure in any of the boilers immediately visible; and every boiler should have a safety-valve of its own, the passage leading to which should have no connection with the passage leading to any of the stop-valves used to cut off the connection between the boilers, so that the action of the safety-valve may be made independent of the action of the stop-valve. In some cases stop-valves have jammed, or have been carried from their seats into the mouth of the pipe communicating between them, and the action of the safety-valves should be rendered independent of all such accidents. Safety-valves themselves sometimes stick fast from corrosion, from the spindles becoming bent, from distortion of the boiler top with a high pressure, in consequence of which the spindles become jammed in the guides, and from various other causes, which it would be tedious to enumerate; but the inaction of the safety-valves is at once indicated by the steam gauge, and when discovered the blow through valves of the engine, and the blow-off cocks of the boiler, should at once be opened and the fires raked out. A cone in the ball of the waste steam pipe, to send back the water carried upwards by the steam, should never be inserted; as in some cases this cone has become loose and closed up the mouth of the waste steam pipe, whereby the safety-valves, being rendered inoperative, the boiler was in danger of bursting.

"309. *Q.* May not danger arise from excessive priming?

"*A.* If the water be carried out of the boiler so rapidly by priming that the level of the water cannot be maintained, and the flues or furnaces are in danger of becoming red hot, the best plan is to open every furnace door and throw in a few buckets full of water upon the fire, taking care to stand sufficiently to the one side to avoid being scalded by the rush of steam from the furnace. There is no time to begin drawing the fires in such an emergency, and by this treatment, the fires, though not altogether extinguished, will be rendered incapable of doing harm. If the flues be already red hot, on no account must cold water be suffered to enter the boiler, but the heat should be maintained in the furnace, and the blow-off cocks be opened, or the wind-hole doors *loosened*, so as to let all the water escape;

but, at the same time, the pressure must be kept quite low in the boiler, so that there will be no danger of the hot flues collapsing with the pressure of the steam.

"310. *Q.* Are plugs of fusible metal useful in preventing explosions?

"*A.* Plugs of fusible metal were at one time in much repute as a precaution against explosion, the metal being so compounded, that it melts with the heat of high-pressure steam; but the device, though ingenious, has not been found of any utility in practice. The basis of fusible metal is mercury, and it is found that the compound is not homogeneous, and that the mercury is forced by the pressure of the steam out of the interstices of the metal combined with it, leaving a porous metal which is not easily fusible, and which is, therefore, unable to perform its intended function. In locomotives, however, and also in some other boilers, a lead rivet is inserted with advantage in the crown of the fire-box, which is melted out if the water becomes too low, and thus gives notice of the danger.

"311. *Q.* May not explosion occur in marine boilers from the accumulation of salt on the flues?

"*A.* Yes; in marine boilers this is a constant source of danger, which is only to be met by attention on the part of the engineer. If the water in the boiler be suffered to become too salt, an incrustation of salt will take place on the furnaces, which may cause them to become red hot, and they may then be collapsed, even by their own weight, aided by a moderate pressure of steam."

(*To be continued.*)

LOCOMOTIVE BOILERS.

To the Editor of the Mechanics' Magazine.

SIR,—Your correspondent (Mr. Hunter) in his remarks upon some of the points in the construction of locomotive boilers—which appear to him as absurd—has not, I am afraid, given the subject that consideration required before coming to a conclusion; you will, therefore, allow me to make a few counter statements, in which I hope to be supported by practical experience.

We have now had a lengthened practice in the workings of our locomotive system, both upon the broad principle involved, as also the exact points to be observed in the details of the arrangement of it as a machine; and with all this practical and theoretical data to guide us, it would be wrong to infer that practical men follow a rule opposed to it. Hence we may safely assume that it has been found the amount of heating *surface in the* fire-box may with efficiency *be increased, keeping before us* the point of safety; for with an increased area there is increased danger to be provided for by additional strength in its construction.

It cannot be determined in practice what amount of heat is absorbed by the fire-box; but it is certain the heat so applied is direct, not divided, but impinging upon the surfaces in what we are led by practice to consider the best and most effective manner; so that it follows from this that any increase of surface in the fire-box is a matter of great importance to the working of the boiler. There may be, and are, objectionable forms used in obtaining or carrying out this principle, but they are by the best makers avoided as much as possible.

I partly agree with your correspondent's remarks upon the arrangement of tubes, &c. The same are placed much too close for the circulation of the water, preventing also their outer surface being cleaned should any sediment be deposited; but the greatest evil of all, so far as effective heating surface is concerned, is their small diameter, which subdivides the heat and flame into such small streams, that the effect is lost before it reaches the smoke-box—that is, allowing the length of tube as now used. To increase the length would only be adding to the evil, and this is now becoming more and more apparent to practical men. The length of tubes increasing the length of the boiler, may (or may not) add to the beauty of the engine; but this is a point engineers are beginning to discard, else they would never place the water-tank above the boiler, as in some cases, giving the engine the appearance of bearing some extraordinary incubus on its back. A locomotive can scarcely be placed in comparison with a marine boiler, the modes of working being rather dissimilar in many points. In the first place, in the marine, the draught is not forced by the blast, as is the case in the locomotive boiler, and the tubes in the former must be placed further apart, to allow the greater quantity of sediment being removed which the water used contains. Secondly, it will be found, as a general rule, that the fire-box or flue surface exceeds the tube surface in a marine boiler, and the tubes are made larger in diameter, for the reason stated above. There is another objection to the length of the tubes in locomotive boilers being increased, namely, the great strain it would create, when working upon sharp curves, upon the guide-horns and axles, whether the engine be of the inside or outside cylinder arrangement. This disadvantage is felt to be so great, that various means and apparatus have been used to obviate it.

I am, Sir, yours, &c.,

ENGINEER.

Manchester, July 1, 1856.

BOYDELL'S TRACTION ENGINE.

To the Editor of the Mechanics' Magazine.

SIR,—The Select Committee of the Board of Ordnance, Woolwich, are now making the experiment with this engine to which we alluded on a former occasion. The first day's performance took place on the 24th. The experiments were two in number, and the results in both cases proved highly satisfactory. Before noticing these, we may place before your readers a short description of the principal parts of the new engine as follows:—

It has two cylinders, each 6½ inches in diameter, working with a stroke of 10 inches. On the one end of the crank-shaft is a fly-wheel, and on the other a small 10-leaved pinion, which either gears in a 96-toothed wheel, 5 feet in diameter, fixed on the carriage-wheel, which is 6 feet in diameter, or else, on being shifted by a clutch, in an intermediate 20-toothed wheel on a separate shaft, on which is a 10-toothed pinion, which then gears in the 96-toothed wheel already mentioned, thus giving a quick and slow motion to the engine, while it enables the driving-pinion to be thrown out of gear in the carriage wheel when required for threshing, pumping, &c. The quick speed of travelling is from 3 to 4½ miles per hour, and the slow one from 1½ to 2¼ miles per hour.

With 60 lbs. steam there will thus be a force of 1,200 lbs. on each piston, or 2,400 lbs. on both. Of this, however, 360 lbs. are lost from extra velocity, so that the actual force applied is 2,040 lbs.

The weight of the engine, with water, &c., is about 9 tons.

Returning now to the two experiments, the first of which was in hauling a heavy siege-gun from the arsenal up Barrage-road to Plumstead-common, and down the steep incline to Watermans' Fields in return; and the second in hauling a gun of the same kind over marshy ground too soft to carry horses. In both cases the result exceeded the most sanguine expectations. The steepest part of Barrage-road is 1 to 10, and the incline down to Watermans' Fields 1 to 6. Of the two, coming down the latter was certainly the master part of this experiment; for in going down it, a brewer's dray-horse took fright, refusing to meet his warlike rival, which stopped in the steepest part of the incline the moment he received the order "stop her," without any other brake but the steam.

In this example the weight of the gun was 5 tons 12 cwt., that of the gun, carriage, and tender 2 tons, 7 cwt., 16 men who were on the carriage and engine, 1 ton, 2 cwt., thus making a total, with the *engine, of about 18* tons, which the 2,040 lbs. (this being the force of steam) propelled up the one hill 1 in 10! and down the other 1 in 6! the wheels of the gun-carriage and tender, which were without endless rails, sinking from 1 to 3 inches in the shingle of which the roads were made.

In the second experiment, the gun and carriage were of the same weight; but in this case the carriage wheels had endless rails, but there were only two men riding, so that the total weight may be stated, as in the first, at 18 tons. Here a rope, capable of sustaining a strain of 10 tons, was broken several times by a fair pull; but, after a good deal of puffing on the part of the "war-horse" on these occasions, he eventually dragged his ponderous load over the bog, thus concluding a good long yoking in triumph—performing what all the artillery horses in the public service could not have done.

When the other experiments are made, we shall endeavour to bring them under your notice.

I am, Sir, yours, &c.,
W. B.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

LOCKE, G. B. *Apparatus, apparatuses, or mechanism for placing detonating or fog signals on the rails of railways to be exploded thereon, and for removing the same therefrom whenever required.* Dated Nov. 5, 1855. (No. 2483.)

The object of this invention is to enable such signals to be placed in position by the intervention of suitable mechanism. This cannot well be described without engravings.

THOMAS, T., the younger. *Improvements in the manufacture of soap.* Dated Nov. 5, 1855. (No. 2484.)

This invention consists in the conjoined use of silicate of soda or of potash, with sulphate of soda, or other salt of soda, or of potash in combination with soap.

NEWTON, A. V. *Improved apparatus for cooling and drying flour.* (A communication.) Dated Nov. 5, 1855. (No. 2485.)

This invention consists in obtaining a draft of cold air over and around the upper mill stone in grist mills, and between the curb and the millstone, by means of a fan and flanges on the inside of the curb, to serve as a guide for the air, and cause it to pass around and over the stone, together with the use of ventilators to allow the escape of the hot air and moisture without blowing away the flour.

DEVAUX, A. C. L. *Improvements in the construction and the fitting up of granaries.* Dated Nov. 5, 1855. (No. 2486.)

The patentee proposes to construct granaries, with bins or chambers of a depth say of 30 feet, which he ventilates by means of air passages formed in the bottom or sides of the bins, and communicating with a main flue supplied with air from suitable blowing apparatus; and by means of endless chains of buckets and archimedean screws he distributes the grain into the bins, and discharges it therefrom, as required.

BROOMAN, R. A. *Improvements in fire-arms.* (A communication.) Dated Nov. 5, 1855. (No. 2487.)

This invention was described and illustrated at page 490 of our Number for May 24, 1856 (No. 1711.)

JESSOP, J. *Improvements in the construction of furnaces and boilers.* Dated Nov. 6, 1855. (No. 2488.)

This invention consists—1. In the employment of a number of discs or wheels, fixed at suitable distances from each other on a shaft, capable of rotating, and applied to the back part of furnaces betwixt the grate bars and the bridge for receiving the clinkers, &c., when pushed from the grate-bars, and carrying the same forward at intervals to the ash-pit underneath. Also in the use of a diaphragm to separate the discs and ash-pit from the ordinary grate-bars and ash-pit, with doors, dampers, or valves, to regulate the admission of air thereto. 2. In constructing boilers with a water space projection over the back part of the grate bars, forming an inverted bridge to the furnace in front of the ordinary bridge, and immediately above the before-mentioned discs, the purpose of which is to deflect the smoke down into close contact with the fuel and clinkers at the back part of the furnace and on the discs.

DANCHELL, F. L. H. *Certain improvements in apparatus for ascertaining the pressure of steam, air, water, or any other fluid or liquid.* Dated Nov. 6, 1855. (No. 2489.)

Instead of admitting the entire pressure of steam, air, water, or fluids, or liquids, to act directly on the indicating instrument for showing the amount of the said pressure, "I only admit," says the patentee, "a part of such pressure to act directly or indirectly upon the said indicating instrument; this enables me to reduce the scale of my mercurial gauge to any lengths."

GOOSE, R. *Improvements in the manufacture of cut nails.* Dated Nov. 6, 1855. (No. 2490.)

This invention consists in making cut nails from taper iron, that is to say from strips or sheets of iron thinner at one end than at the other.

SCHLOSS, J. *A new mounting for travelling bags. Dated Nov. 7, 1855.* (No. 2491.)

This invention is characterised by the application of rectilinear grooves or guides, so contrived as to guide the motion of the jaws as they open or shut.

THRELFALL, R., and J. HIGSON. *Improvements in machinery or apparatus used in preparing or sizeing and dressing yarns for weaving.* Dated Nov. 6, 1855. (No. 2492.)

This invention relates to a mode of regulating the width of the dressed yarns in sizing machines and tape frames, whereby the wraith or comb bar is dispensed with. The improvements consist in the use of an adjustable roller, in conjunction with an arched or curved bar, which is termed a contracting bar.

LISTER, S. C. *Improvements in weaving pile fabrics.* Dated Nov. 6, 1855. (No. 2493.)

This invention in pile looms consists in having a slide mounted on bars or levers which oscillate at the side or selvage of the fabric, so that the wires, after being withdrawn, are by their movement brought opposite the open shed, and then are moved along with the slides to which they are fixed and placed in the warp, and are then beaten up, the slides and wires moving in advance of the slay. When wires fixed to slides have been used, it has always been difficult to insert a sufficient number of wires. This the patentee accomplishes by placing arms which carry the slides and wires so as to oscillate upon centres above as well as below.

JEFFREYS, E. *An improvement in the construction of furnaces.* Dated Nov. 6, 1855. (No. 2495.)

Instead of setting all the fire-bars in the same horizontal plane, the patentee arranges them at different levels, rising from the central group to the sides, or from the sides to the central group. These fire-bars he mounts in a rocking frame, capable of being rocked by the stoker on the trunnions which support it, and thus of changing the level of the fuel.

COTSELL, G. *An improved gutter and kerb for roads and streets.* Dated Nov. 7, 1855. (No. 2496.)

Claim.—Constructing a gutter and kerb of a hollow box or pipe, with a lateral grating or series of apertures for the admission of the water and surface drainage, and for preventing the entrance of large solid substances.

HANSON, C. *Improvements in fire-arms.* Dated Nov. 7, 1855. (No. 2497.)

This invention comprises a method of connecting the trigger of fire-arms with a lever, which has a motion about a centre, in such manner that in order to discharge the fire-arms the lever must be raised, and the trigger pulled simultaneously, and a

method of working the ramrod of revolving fire-arms by means of a bent lever centered on a pin, and with its end taking into a slot in the ramrod.

HALEY, J. *Improvements in the buffers and spring draw-bars of waggons or other railway vehicles, and in the application of the same.* Dated Nov. 7, 1855. (No. 2499.)

This invention relates—1. To short stroke buffers, or buffers having hitherto a ram working in a casing and pressing against a spring, and consists in connecting together, by means of a cross plank, the two buffers at the same end of the carriage, having separate and distinct springs of any elastic substance. 2. The improvements in spring draw-bars consist in an arrangement by which the use of separate springs is avoided, and the buffer-springs are made to serve the additional purpose of springs to the draw bar.

SCHOLEFIELD, F. *Improvements in machinery or apparatus for cutting paper, cardboard, and similar materials.* Dated Nov. 7, 1855. (No. 2500.)

The patentee describes an arrangement of parts of such a character that by causing a bowl or roller attached to the knife-holder to move in a groove or guide fixed on one of the side frames, or between them, when the power is applied to draw down the knife perpendicularly, it also performs a movement endwise during the cut.

KENWORTHY, W. *Certain improvements in steam engine valves, and in the mode of working the same.* Dated Nov. 7, 1855. (No. 2502.)

This invention consists of working steam expansively with the flat slides or D valves, or with any other form of steam-engine valve, by a crank or common eccentric motion in combination with a differential eccentric, and a modification in the construction of the valves.

DAVIS, W. *Improvements in the construction and arrangement of furnaces and furnace bars for the better combustion of smoke and prevention of loss of heat by radiation.* Dated Nov. 7, 1855. (No. 2503.)

This invention consists—1. In constructing some of the bars of a furnace with deep flanges or projections in the direction of their length, on the upper part of the bar, carried as high as the top of the fuel, and so that when two such bars are placed together, an air channel or space is formed between them, for the passage of air to the upper part, or above the fuel in the furnace. The patentee also constructs furnace bars, with an upturned part at the back end, the whole forming a bridge at the throat of the furnace. 2. In placing a cellular construction on the interior of the furnace door, and admitting continuously to *such cells a* sufficient quantity of air through the door, to maintain the interior of such cells as are next the door at a low temperature. The introduction of air at the fire-door is to prevent radiation of heat.

ADVIELLE, L. B. *An improved process for silvering metallic articles.* Dated Nov. 7, 1855. (No. 2504.)

The patentee dissolves 3¼ ounces of silver in about 6½ oz. of nitric acid. He likewise dissolves about 32 oz. of cyauret of potassium in ten quarts of water, and pours this solution into the nitrate of silver. To this he adds about 6½ oz. of well-pounded whiting, and thus obtains "Argentine water." He immerses the articles in a bath composed of one part of this diluted with two parts of water, and when the article is well impregnated it is to be rubbed with dry whiting, and washed and rubbed with a dry cloth, and the article will assume a white and brilliant appearance.

JOHNSON, W. *Improvements in the manufacture and application of prussiates and other colouring matters.* (A communication.) Dated Nov. 7, 1855. (No. 2505.)

The invention relates, in the first place, to the application in the manufacture of Prussian blue, &c., of the refuse matter of the gas purifier, and of soot and other refuse matters from chemical works, foundries, glass works, and kilns, where a certain quantity of fuel is consumed. The invention also comprehends the use of soluble silicates in the manufacture of prussiates, and the use of insoluble soaps, such as the stearates or resinates of lime or magnesia, as bases for the blue colouring matter; also the use in the manufacture of blue balls for washing purposes of apparatus similar to that used for making pills for lozenges.

WAKEFIELD, J. *Improvements in machinery for working the slides and steam valves of engines driven by steam or other elastic fluid.* Dated Nov. 7, 1855. (No. 2506.)

This invention consists in working the slides and steam valves of engines by means of eccentric sheaves, having inclined teeth on their inner surface, with suitable sliding guides working on or over the driving guides forged or fixed on the crank shaft, combined with sliding racks with inclined teeth on each, acting on the corresponding teeth on the inner surface of the eccentric sheave, and passing through the driving guide, the racks being also connected to a clutch on the shaft, such racks and clutch being slidden along the shaft as required by means of the reversing lever.

POUILLET, C. M. *Certain improvements in railways.* Dated Nov. 7, 1855. (No. 2508.)

This invention consists—1. In the employment of sleepers supported upon and fixed to what are termed pressure tables or

bearers, and provided with cast iron or other chairs. 2. In a new description of iron chair. 3. In arrangements for joining the ends of rails by splints or side plates, secured by bolts, rivets, or clamping; and also fixing the rails to the sleepers, by clamps, bolts, or screws. 4. In the employment of pressure tables and sleepers in which apertures are formed to receive the rails, whereby chairs are dispensed with. 5. In a frame or apparatus for effecting the changing or crossing from one line of rail to the other. 6. In the employment of girders with pressure tables or bearers to support flat-bottomed rails.

LUND, W., and A. BAIN. *Improvements in pencil cases.* Dated Nov. 7, 1855. (No. 2509.)

This invention relates to those pencil cases in which there is a groove or channel to contain a length of lead, and a slit for a slide and propeller to work in and push forward the lead as required, and it consists in forming the slide to propel the lead in such manner that it shall clip the outside of the case and form a spring; or that it shall be so shaped on the inside as to form a spring against the sides of the groove in the pencil case; or that it shall be so formed as to act as a spring both inside and outside of the pencil case. It also consists in cutting in, or fixing upon the pencil case, a rack, into which a spring clip or propeller takes, in order to propel the lead forward each time it is moved a distance equal to the length of the division between the teeth of the rack.

GODDING, T. *Improvements in the fastening for stays, corsets, and bands.* Dated Nov. 7, 1855. (No. 2510.)

The patentee annexes two busks, one at each side of the stays. In the under busk he inserts hooks (which will turn round) with the hook or fastening part toward the outside of the busk. This hook or fastening adjoins to the lower busk. He also makes eyelet or other holes in the stays or busk. The stays are fastened by wrapping the upper busk over or against the lower, and introducing the top part of the hook into the hole or holes. The hooks are then turned round or reversed.

BROWN, C. A. *A machine for manufacturing bricks.* (A communication.) Dated Nov. 7, 1855. (No. 2511.)

This invention consists in the combination of two outside and any even number of inside plungers, from four upwards, with a skeleton wheel and moulds, together with other arrangements of parts which cannot be described without engravings.

BETJEMANN, H. J. *Improvements in expanding or extending tables.* (Partly a communication.) Dated Nov. 7, 1855. (No. 2512.)

Claim.—Combining the parts of an expanding table in such manner as to cause the outer legs to unfold and fold by the movement away of parts of the surface table from and to a central pillar or support; also, in such manner that the two ends may be moved away from a central pillar or support; also, in such manner as to admit of the "leaves" out of use being placed below the upper surface of the table.

BOUSFIELD, G. T. *Improvements in wrought-iron shafts for steam boats, and other purposes, where great strength is required.* (A communication.) Dated Nov. 7, 1855. (No. 2513.)

This invention consists in constructing each shaft of several pieces, caused to retain the form of a shaft by means of being fitted together, and bound by strong hoops or rings of wrought-iron. A central bar is used of small diameter, having around it several sectional pieces which make up the diameter desired.

OLIVE, J., and W. OLIVE. *Improvements in the manufacture of wheels for railway and other purposes.* Dated Nov. 9, 1855. (No. 2520.)

This invention consists—1. In manufacturing wrought-iron wheels for railway and other purposes of two discs connected together at the circumference by a hoop, and at the centre by a tube forming the nave, to both of which the discs are welded. 2. In attaching the tyre to the body of the wheel by means of screws tapped into the body of the wheel. 3. In connecting the two discs of large wheels by means of hoops or tubular stays.

RAYWOOD, J. *An improved rolling, dribbling, sowing, and harrowing machine for wheat and other agricultural produce.* Dated Nov. 9, 1855. (No. 2521.)

This invention, one feature of which consists in regulating the revolution and arrangement of the seed deposit or by a strap or gearing, so that it shall rotate in conformity with the dibbles and pressers, and cause the seed to drop at any required distance, and in any necessary quantity, requires engravings to illustrate it.

FLETCHER, H. *Improvements in the manufacture of nuts, bolts, and other similar articles, and in machinery or apparatus for making the same.* Dated Nov. 9, 1855. (No. 2523.)

To make square unscrewed nuts the patentee constructs a punching machine, with frame-bed and table, together with rollers and cams, so that the square or flat-nut iron to be punched may be forced forward and held stationary at certain intervals to form the length or size of the nut. He attaches to the machine a circular saw at right angles with the iron bar, and causes the saw to ad-

vance to and recede from the bar at intervals, and thus cut from the bar pieces of iron the requisite size for the nuts, which are then punched, and, if desired, shaped also by apparatus working in concert with the advance of the bar and the saw, thus forming a nut at each interval. To make hexagonal nuts he employs similar machinery to the above, but uses hexagonal bar iron. One of the improvements in the manufacture of bolts is chiefly applicable to "fish-plate joints," used in connecting the rails of railways. The patentee uses one piece of iron, in the form of a staple or clip, instead of the two ordinary bolts used to join the two plates and rails together. Another improvement in bolts or spikes relates to those requiring heads; and, to save expense, he rolls the iron bars with lumps at certain intervals by cutting the rolls to the form required.

WALENN, W. H. *Certain new and useful improvements in looms for weaving seamless bags and other open double fabrics of a similar character.* (A communication.) Dated Nov. 9, 1855. (No. 2525.)

A loom constructed according to this invention contains two complete sets of harness, and mechanism to operate the two sets independently of each other. It also contains two shuttle-races, placed one above the other in front of the same reed, and two shuttles, which are both at all times in operation. In weaving the bag, though only one warp is used, two independent sheds are opened continually, one above the other, and the two shuttles follow each other through the upper and lower sheds, and thus produce a fabric composed of two parts united at the edges.

HAMPTON, C. J. *Improvements in the manufacture of iron.* Dated Nov. 9, 1855. (No. 2526.)

This invention consists in applying a combination of lime with an alkali or alkaline salt, in the puddling and refining furnaces. For which purpose the alkali or alkaline salt is dissolved, and the solution mixed with quick lime, and in this state is introduced into the puddling or refining furnace, with or without other matters.

BENTLEY, W. H. *Improved cannon, guns, and other fire-arms and appendages thereto, and in the capsules, cartridges, and projectiles for the same and other fire-arms.* Dated Nov. 10, 1855. (No. 2529.)

This invention consists of a number of arrangements which cannot well be described without illustrations.

SCOTT, J. *Improvements in corking bottles, jars, and other receptacles.* Dated Nov. 10, 1855. (No. 2530.)

This invention consists in preventing the compression of the air within a vessel, by means of a thin *tube or hollow instrument* interposed between the side of the cork and the side of the neck of the vessel during the time the cork is being driven into it. The instrument is afterwards withdrawn, the cork, from its elasticity, filling up the space it occupied.

NEWTON, A. V. *Improvements in transmitting fac-simile copies of writings and drawings by means of electric currents.* (A communication.) Dated Nov. 10, 1855. (No. 2532.)

The object of this invention is to convey with great rapidity the fac-simile of handwritings and drawings to any distance whatever, or without changing anything in the disposition of telegraphic lines already existing.

WICKENS, H. *Improvements in locomotive steam engines, and in apparatus in connection therewith, parts of which improvements are respectively applicable to other steam engines and purposes.* Dated Nov. 10, 1855. (No. 2534.)

These improvements consist—1. In the introduction of retorts into the fire-box or furnace of a locomotive engine, that the same may be kept at a red heat, and each of them having a cover or lid to allow them to be conveniently charged with iron turnings or other suitable materials. One end of a pipe communicates from the boiler or steam cylinder to each retort, so that steam may pass into it, and, becoming decomposed by the action of the heat, and the oxygen being to a great extent taken up by the iron turnings, the hydrogen gas is liberated through small holes into the furnace, to mix with the products of combustion. 2. In constructing the steam whistle with two tongues of steel. 3. In suspending a rod to work like a pendulum, having signals fixed thereon, and being caused to oscillate by the force of steam passed through a pipe. 4. In forming the buffers by means of cylinders, having a sufficient quantity of oil therein, which will not freeze, and fitted with pistons attached to buffer rods working through stuffing-boxes, and such cylinders having valves so formed that when the piston is forced in the valves are closed, the oil being then allowed to escape through a small aperture in the valves into a closed pipe; a great and gradual resistance is thus offered.

CROSLEY, W. *Improvements in gas meters.* Dated Nov. 12, 1855. (No. 2535.)

These improvements relate to wet gas meters, and mainly consist in regulating the level of the water-line within the hollow cover of the measuring wheel, by introducing an overflow-pipe communicating with the atmosphere at any portion of the meter below the true water level, and in the application of an hydraulic seal to the water line or overflow-pipe, such seal being formed

by an inverted cup, so arranged as to constitute a double seal, and thereby prevent the water forming such double seal from being surreptitiously abstracted.

BUILLOTTE, J. C. A. *An improved letter-copying press.* Dated Nov. 12, 1855. (No. 2536.)

This press consists of two plates and four uprights disposed by twos opposite to one another, so as to admit the journals of two pointed bevelled levers between them. The levers are made to assume two different positions, one vertical for effecting the pressure, the other horizontal for releasing the book. A vertical rod is adjusted at the centre of the upper plate. On causing the rod to revolve back from the centre, two small arms are made to release the two levers, which may then be raised to a vertical position, and give the necessary pressure on the book laid between the two plates.

MARGUERITTE, L. J. F. *Certain improvements in the manufacture of vitreous products.* Dated Nov. 12, 1855. (No. 2537.)

The improved vitreous compound contains some silica and alumen, but neither potash nor soda; this want constitutes the chief character of this invention. For instance, by calcining a mixture of silica 65·47, lime 25·80, alumen 8·73, a perfectly transparent glass is obtained.

HALL, W. K. *The prevention of steam-boiler explosions.* Dated Nov. 12, 1855. (No. 2538.)

This invention was described at length in our last volume (see vol. lxiv., p. 273, No. 1702.)

COOKE, G. *Improvements in flyers used in roving and slubbing-frames.* Dated Nov. 12, 1855. (No. 2540.)

This invention relates to roving and slubbing-frame flyers in which the presser is attached to or made with a piece of metal turning upon the leg of the flyer, and which piece acquires a centrifugal force which causes it to force the presser against the roving as it is wound on the barrel, and it consists in forming the top part of the said piece of metal with a nib or projection by which it is suspended from or supported on the bearing at the upper part of the flyer-leg, whereby the weight of the piece of metal is thrown more from the centre on which it turns, and the centrifugal force acts so as to produce a more uniform action of the presser during the winding of the roving upon the barrel.

HITT, T. *A new method of obtaining power for propelling vessels, and certain new propelling machinery.* Dated Nov. 12, 1855. (No. 2541.)

A description of this invention is given on page 1 of this Number.

BORLAND, J. Y. *Improvements in spinning, and machinery for preparing and spinning fibrous materials.* Dated Nov. 12, 1855. (No. 2542.)

This invention relates to mechanism for continuously twisting a sliver or thread, and at the same time winding it into a cop or bobbin form. The chief peculiarity in respect to the parts immediately operating to effect the twisting and winding up of the thread or sliver consists in the arrangement of a peculiarly-formed tube in independent rings, which has a revolving motion given to it to put in the required amount of twist in the sliver or thread which passes through its interior, in combination with a spindle having its axis also in independent bearings in a line corresponding with the axis of the tube, into the interior of which the end of the spindle can enter.

JOHNSON, J. H. *Improvements in casting metals.* (A communication.) Dated Nov. 12, 1855. (No. 2546.)

The improvements consist in the employment of a circular chill or mould, fitted on to the end of a shaft working in suitable bearings, and rotating at a high velocity. The interior circumference of the chill is made to correspond to the periphery of the article to be cast. The metal is poured into the rotating chill or mould, and is immediately driven by the centrifugal force to the circumference, where it is allowed to set or cool.

[PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

BROOMAN, R. A. *Improvements in generating motive power.* (A communication.) Dated Nov. 3, 1855. (No. 2472.)

This invention consists in generating vapour from a mixture of alkaline water and ether.

NUTTALL, J. *An improved gauntlet-glove and cuffed glove.* Dated Nov. 5, 1855. (No. 2477.)

In this invention, between the wrist and the underneath portion or palm of the glove elastic material is inserted or attached.

GUILLEMOT, M. *Certain improvements in stopping horses.* Dated Nov. 5, 1855. (No. 2480.)

This invention consists of two pieces, to each of which is attached a small stopper, corresponding to the nostrils of the horse, so that by managing these two pieces the nostrils of the animal can be either slightly closed or entirely stopped up.

DUGDALE, A. *Improvements in the construction of locomotive engines, applicable in part to marine and stationary engines.* Dated Nov. 6, 1855. (No. 2494.)

This invention relates to a mode of retarding the progress of locomotive steam

engines. To effect this object the inventor converts the steam from a propelling to a resisting medium, by means of a slide-valve formed of iron and steel plates, and thereby suddenly presents an elastic obstruction to the advancing piston in the steam cylinder.

HART, C. *Improvements in threshing and dressing-machines.* Dated Nov. 7, 1855. (No. 2498.)

A description of this invention is given on page 6 of this Number.

CRAIG, W. G. *Improvements in bearing, buffing, and draw-springs, applicable to the rolling stock of railways and other vehicles.* Dated Nov. 7, 1855. (No. 2501.)

This invention relates to a mode of applying a draw-shoe to railway and other vehicles, and consists of connecting the two sliding shoes by shafts or tension rods with a spring or elastic medium between them.

DRAY, W. *Improvements in apparatus for heating, baking, and drying.* Dated Nov. 7, 1855. (No. 2507.)

This invention consists in surrounding a vessel with a serpentine flue, and in causing heat from a fire, or hot air, or other heating medium, to travel in the flue round the vessel prior to its exit into the atmosphere.

SIEMENS, C. W. *Improvements in evaporating brine and other liquids, and in distillation.* Dated Nov. 7, 1855. (No. 2514.)

According to these improvements the evaporation is effected by exposing the liquid in a covered pan, with a double bottom, to the influence of a circulating current of a permanent gas, in such a manner that the current passes in a zigzag or circular manner along the surface of the evaporating liquid, commencing at the end opposite the source of heat, and advancing towards the heated end. At intervals portions of the current descend into the double bottom, and return towards the cooler end of the pan, passing finally through a condenser containing a series of pipes filled with the cold liquid.

BURGIN, T. *An improved construction of ledger hand-rest.* Dated Nov. 7, 1855. (No. 2515.)

The object of this invention is to provide a rest for the hand when writing at the bottom of the leaf of a thick book. The inventor attaches to one end of a piece of thin metal or hard wood, a rest-piece, and shapes this piece so that it shall form a support for the rest-piece. The thin part is slipped under some dozen or twenty leaves of the book, and the weight of the overlying leaves counterbalances the pressure of the writer's hand, and supports the same.

PAGE, C. *An improved construction of railway signal apparatus.* Dated Nov. 8, 1855. (No. 2517.)

The inventor sinks in the earth, in close proximity to the rails, a box, in which a weighted cam is mounted, and through the cover of this box projects a vertical sliding stop-piece, which rests upon the edge of the weighted snail cam. This stop-piece meets the wheel, or an arm, or other projection of an advancing locomotive engine, and is depressed thereby, for the purpose of rocking the cam. To one extremity of this cam is attached a draw-rod, which is connected to signal apparatus.

GASTE, L. *Improvements in binding account and other books.* Dated Nov. 8, 1855. (No. 2518.)

In place of forming the back, and affixing it to the book and to the covers as heretofore, the back is made partly of metal in the following manner:—The inner plate of metal is bent to the desired form of the back, and it has slits through it at intervals near to its two edges, through which slits the straps (by preference of woven fabric) pass, so that the two ends of each come within the curved inner metal plate, and thus are brought to proper positions to be affixed to the covers. The outer plate of metal forming the back is wider than the inner one, and is turned up at the edges, so as to enclose the inner plate. Between the plates woven fabric, leather, or other flexible material is placed, and these parts are combined together by rivets passed through them.

GOODMAN, G. B., and G. A. WEBSTER. *Improvements in apparatus for reflecting the back, front, and sides of the figure and head in a mirror or toilette-glass at one view.* Dated Nov. 9, 1855. (No. 2522.)

This invention consists of a chair or seat, to the back, sides, or front of which is secured by screws, &c., one, two, or more mirrors, enclosed in frames, and supported by uprights on which they swing.

BRAMWELL, J., and J CRAWFORD. *Improvements in ordnance.* Dated Nov. 9, 1855. (No. 2524.)

This invention relates to the manufacture of wrought iron or steel guns, &c., of large calibre, and consists in forming them of a number of wrought-iron or steel rings jointed together by dove-tail joints, in such a manner that in their contraction, both circumferentially and longitudinally, they will grip or tighten up the gun.

PRITCHARD, T. *Improvements in manufacturing welded iron tubes.* Dated Nov. 9, 1855. (No. 2527.)

In carrying out this invention, a peculiar form of die is employed, by which the tube as it is formed, and passes through the die, receives a succession of pressures by which the diameter of the tube is reduced progressively, and the weld most effectually produced by once heating the iron.

PIGGOTT, W. P. *Improvements in galvanic, electric, and electro-magnetic apparatus, and in the mode of applying the same as a curative and remedial agent.* Dated Nov. 10, 1855. (No. 2528.)

The inventor first constructs a brush consisting of a mixture of bristles and metallic wires or plates, or he coats a portion of the bristles forming the brush with metal, by electric deposition, and these metallic wires, plates, or electrotyped or metallised bristles, communicate with and receive electricity, galvanism, or electro-magnetism from a battery fixed in the frame of the brush or otherwise, causing positive or negative currents to pass from the ends in contact with the hair or skin. And secondly, he constructs a bath, one part of which will communicate positive, and the other negative electricity.

ESKELL, L. *A new enamel for filling or stopping decayed teeth.* Dated Nov. 10, 1855. (No. 2531.)

The inventor forms an enamel by combining stearic acid (commonly known as stearine), New Zealand gum, pure sulphate of lime, blood, shell-lac, and carradan balsam.

HALL, W. K. *Improvements in boilers for generating steam.* (A communication.) Dated Nov. 12, 1855. (No. 2539.)

In this invention the water spaces, to which the larger portion of the heat is applied, are continued upwards above the level of the water in the boiler, without being exposed to the action of the fire, in such a manner that the water has no tendency to return in them, but continues to flow uniformly in accordance with the steam which is formed by its passage over the heated surface, the downward current being supplied by the larger water spaces, as ordinarily arranged.

ASTON, W. H., and S. HOPKINSON. *Improvements in steam boiler furnaces and apparatus employed for supplying water to steam boilers.* Dated Nov. 12, 1855. (No. 2543.)

In this invention the water is caused to pass by a pipe from the upper part of the feed pipe to a close cistern or hollow bridge in the flue, and is then by a tube conveyed through a second closed cistern which is at the end of the fire-bars, and then through two series of tubular fire bars before it enters the boiler.

KIDD, J. *Improvements in machinery and apparatus for sewing or stitching and ornamenting cloth or other fabrics.* Dated Nov. 12, 1855. (No. 2544.)

These improvements relate to that class of sewing or stitching machinery where two threads are used. One thread is placed in a stationary thread-holder of convenient shape, and the other is conducted by a needle, which has a vertical and inclined motion imparted to it, and is thereby caused to move the thread round the stationary thread-carrier or holder.

BARCLAY, A. *Improvements in indicating the pressure of steam and other fluids, which improvements are also applicable to governors and other regulating apparatus.* Dated Nov. 12, 1855. (No. 2545.)

This invention relates to apparatus for indicating the pressure of steam, &c., and is carried out under various modifications. According to one plan, the apparatus consists of a tube of caoutchouc closed at one end, whilst the other end is in communication with the boiler. The tube is enveloped by a helical spring of metal wire, for preventing its lateral dilatation, and for aiding its reaction or contraction. An index pointer fixed to the tube is made to traverse over a scale, as the variation in the internal pressure causes the elastic tube to elongate or contract, the scale being suitably divided.

JOHNSON, J. H. *Improvements in the manufacture or preparation of hard India-rubber and in the application thereof to the construction of parts of textile and other machinery.* (A communication.) Dated Nov. 12, 1855. (No. 2547.)

This invention consists in the mixing with the India-rubber and sulphur the shells or scales of oysters calcined and reduced to powder, or other cheap substance, for increasing the volume and reducing its cost; and in the application thereof to the manufacture of the bobbins, cylinders, and rollers, and coupling or clutch-boxes used in spinning machines, &c., and of the racks and ratchet-wheels employed in looms and spinning machines. Also to the manufacture of plate-bolsters of spinning machines, to all bearings and footsteps in connection with the plate-bolsters, to bearings of shafts of machinery generally, and to spindles.

THORNTON, W. C., and B. *Improvements in machinery or apparatus for preparing and spinning wool, which improvements are also applicable to washing and wringing machines for the same material.* Dated Nov. 12, 1855. (No. 2548.)

This invention consists in covering the rollers used for drawing or conveying wool in preparing and spinning machinery with vulcanised India-rubber. Rollers for washing and wringing in wool machines are covered in the same manner.

HENSON, W., and H. O. PALMER. *Improved apparatus for propelling vessels.* Dated Nov. 12, 1855. (No. 2549.)

The chief object of this invention is to provide barges (for canal use) with a stern propeller capable of vertical adjustment to suit the varying loads carried by such ves-

sels. The propeller consists of a broad paddle-wheel set within the barge frame and shielded so as to produce as little disturbance as possible in the water. To effect the adjustment of the propeller it is mounted in a frame which is carried by and turns upon the crank shaft of the engine. This frame is raised and lowered by a worm shaft, &c.

*** No. 2516 has not been granted.

PROVISIONAL PROTECTIONS.

Dated March 29, 1856.

768. Charles Durand Gardissal, Bedford-street, Strand, London. Certain improvements in machinery for sweeping streets and other ways. A communication.

Dated May 14, 1856.

1140. Alphonse Meillet, of South-street, Finsbury, London, gentleman. An improved artificial stone for grinding, sharpening, and polishing.

Dated May 22, 1856.

1224. Charles Barreswil, of Paris, France, chemist. Improvements in gas-meters.

Dated June 10, 1856.

1374. Henry Wagner, of Everitt-street, Russell-square, Middlesex, upholsterer. Improvements in beds and mattresses and in similar articles of bedding.

1376. William Brooks, of Chancery-lane, London. Improvements in the treatment of corn. A communication.

1378. Perceval Moses Parsons, of Duke-street, Adelphi, Middlesex, civil engineer. Certain improvements in the permanent way of railways.

1380. Armand Eugène Preux, of Paris, France. Warming railway and other vehicles.

1382. William Wilson, of Newcastle-upon-Tyne, fur cutter. Improvements in machinery for pulling the hair from coney and other skins. Partly a communication.

Dated June 11, 1856.

1383. Henry Benson James, of Derby, Derbyshire, engineer. Improvements in moulding metallic castings.

1384. William Henry Westwood, Thomas Wright, and Edward Wright, of Queen's-cross, Dudley, Worcester, boiler and gas-holder makers and engineers. An improved stop or regulating valve.

1385. William Bayliss, of Birmingham, Warwick, tube maker. A new or improved manufacture of ornamental metallic tubes.

1387. James Combe, of Belfast, Ireland, machine maker. Improvements in machinery for carding and roving tow, and other fibrous substances, part of which improvements is applicable for transmitting motion in other mechanism.

1388. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improvements in breech-loading fire-arms. A communication.

Dated June 12, 1856.

1389. Richard Archibald Brooman, of Fleet-street, London, patent agent. Improvements in the manufacture of spoons, forks, and other similar articles, and in the machinery employed therein. A communication from W. Conraetz, of Vienna.

1390. James Elves, of Cornhill, London. Improved machinery for extracting oil from oleaginous seeds. A communication.

1391. Philip Wesley Hardwick, of Gibson-square, Middlesex, gentleman. An improved manufactute of tickets for railway and other uses.

1392. Philip Unwin and John Unwin, of Rockingham-street, Sheffield, York, cutlery manufacturers. Improvements in the manufacture of pen and pocket knives.

1393. Daniel Spill, Stepney-green, Middlesex, waterproofer. Improvements in purifying spirits of tar or coal tar naphtha.

1394. James Fairclough, of Liverpool, Lancaster, upholsterer and cabinet maker. An improved expander and contractor for dining tables.

1395. John Stenhouse, of Upper Barnsbury-street, Islington. Improvements in the preparation of a decolourising material, suitable for the treatment of acid, alkaline, and neutral solutions.

1396. Charles John Lewsey, of Albion-terrace, Commercial-road East, Middlesex, engineer. Improvements in sugar cain mills.

1397. George Louis Stott, of St. George's, Gloucester. Improvements in purifying gas.

Dated June 13, 1856.

1398. Thomas Cowburn, of Manchester, engineer. Improvements in valves for reducing the pressure of steam or other liquids or fluids.

1399. William Massey, of Manchester, Lancaster, manager. Improvements in looms for weaving.

1400. Constant Jouffroy Duméry, of Paris, France, civil engineer. Improvements in machinery to be used for manufacturing shoes and boots.

1401. William Richard Whitmore, of Cambridge-terrace, Clapham-road, Surrey, engineer. Improvements in multitubular steam boilers.

1402. William Mason, of Pembroke-dock, inspector of joiners, H. M. dockyard, Pembroke. An improved rowlock for boats.

1403. John Le Cappelain, of New Bridge-street, Blackfriars. Improvements in machinery for bending sheet iron into corrugated forms for constructing beams. A communication.

1404. Servans de Jong, of New Hampstead-road, Middlesex. Improvements in warming and ventilating apartments and buildings.

1405. William Jacot, of Molyneux-place, Water-street, Liverpool, Lancaster, merchant. Improvements in fire arms. A communication.

1406. Peter Armand Lecomte de Fontainemoreau, of South-street, Finsbury, London. Certain improvements in ship-building. A communication.

Dated June 14, 1856.

1407. Hypolitte Mège, chemist, of Paris. Improvements in the manufacture of bread.

1408. Joseph Bunnett and Joseph George Bunnett, of Deptford, Kent, engineers. Improvements in the manufacture of sash-bars, columns, and mouldings for building and decorative purposes.

1409. Jean Etienne Mechard, chemist, of Annecy, Piedmont. Improvements in printing or dyeing skeins, tissues, or other textile fabrics of cotton, wool, flax, and other fibrous substances. A communication from J. P. Vautravers, of Annecy.

1411. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Certain improvements in metallic packing for stuffing-boxes and pistons. A communication.

1412. Etienne Auguste Aublet, of Paris, France. Improvements in rotary engines.

1413. William Wright, of Forth-street, Newcastle-upon-Tyne, glass manufacturer. Improvements in the manufacture of articles of glass and plastic materials by means of pressure.

1414. William Seed, of Preston, Lancaster, machine maker. Certain improvements in "lap machines," or apparatus used in the preparation of cotton and other fibrous substances for spinning.

1415. Edward Lindner, of New York, U. S. Improvements in breech-loading fire-arms.

Dated June 16, 1856.

1416. Joseph Sutcliffe, foreman, and James Leech, cotton spinner, of Rochdale. Improvements in machinery or apparatus for opening, cleaning, and preparing cotton, wool, and other fibrous substances.

1417. Charles Desnos, of Bedford-street, Strand, Middlesex. Improvements in furnaces for consuming smoke. A communication from Mr. C. Descos, of Paris.

1418. Edouard Guérin, of Paris, France, civil engineer. A self-acting apparatus for working railway brakes.

1419. William Henry Barlow, of Derby, civil engineer, and William Henry Woodhouse, of Parliament-street, Westminster, civil engineer. Improvements in connecting and securing the ends of rails of railways.

1420. James Ball Mannix, of Westminster, Middlesex. A method of applying locomotive power to the working of inclines. A communication.

1421. William Turner, of Tunnicliffe, near Rochdale, woollen carder, George Hulme, of George-street, Rochdale, machine maker, and Henry Blackburn, of Milnrow, near Rochdale, manager. Improvements in condensing and other carding engines, billies and mules for carding, slubbing, and spinning woollen, cotton, or other fibrous substances.

Dated June 17, 1856.

1422. John Gedge, of Wellington-street South, Strand, Middlesex. Improvements in building materials. A communication from E. A. Heurteau, of Checy, France.

1423. John Gedge, of Wellington-street South, Strand, Middlesex. An improved pump, reservoir, and apparatus for measuring liquids. A communication from A. J. Gendry, of Dinant, Belgium.

1424. Joseph Davis, of Birmingham, Warwick, manufacturer. A new and improved method of manufacturing the small coke, commonly called breezes, which said method of manufacture economises heat, and effects the suppression or partial suppression of smoke.

1425. Henry Holland, of Birmingham, Warwick, manufacturer. Improvements in the manufacture of umbrellas and parasols.

1426. John Sadler, Josiah Green, and Thomas Davis, of Birmingham, manufacturers. Improvements in the manufacture of hinges.

1427. Arthur George Baylis, of Redditch, Worcester, manufacturer. An improvement or improvements in needles.

1428. James Eives, of Cornhill, London. An improved dynamometer. A communication.

1429. John Henry Johnson, of Lincoln's-inn-fields, Middlesex. Improvements in the treatment of sugar canes, and in the apparatus employed therein. A communication from Titus Lespès, of Martinique, distiller.

1430. Frederick Collier Bakewell, of Haverstock-terrace, Hampstead, Middlesex. Improvements in percussion bomb shells. A communication from John Lippincott, of North America.

1431. William Baynton, of High-street, Bilston, Stafford. Improvements in rolling rails for railways.

1432. Alexandre Depai, Rue de Bercy, Paris. Improvements in brakes for railways.

1433. Christopher Nickels, of the Albany-road, Surrey, and James Hobson, of Leicester. An improvement in weaving when Jacquard or other ornamenting apparatus is employed.

Dated June 18, 1856.

1434. Raymond Leopold de Berenger, of Enfield, *Middlesex, farmer. Improvements in nosebags.*

1435. Thomas Burton, of Padiham, near Burnley, Lancaster. Improvements in machinery or apparatus for sizing and dressing warps, yarns, or threads.

1436. Walter Henry Tucker, of Fleet-street, London. Improvements in locks and latches.

1437. Matthew Andrew Muir, and James McIlwham, of Glasgow, Lanark, N.B., machinists. Improvements in looms for weaving.

1438. Charles Clifford, of the Temple. Improvements in boat-lashings, and in blocks and apparatus used for raising and lowering boats and other articles.

Dated June 19, 1856.

1441. George Tillett, of Clapham, Surrey, bedstead manufacturer. Improvements in bedsteads.

1443. Francis Gybbon Spilsbury, of Chaudfontaine, Belgium, gentleman. Making soda and alum.

1445. Theodore Schwartz, of New York, U.S. An improved brick.

1447. William Mills, of Lower Craven-place, Kentish Town. Improvements in pianofortes.

1449. Jacinto Dias Damazio, of Lisbon, Portugal, merchant. A new process of making illuminating and heating gas by a double distillation without retort. A communication.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

1439. Charles Edmond Green, of Blandford-street, Portman-square, Middlesex. Improvements in tents, huts, and camp hospitals. June 18, 1856.

1450. William Radley, of Hill-street, Peckham, Surrey, surgeon. Improvements in machinery, apparatus, materials, and processes for preparing and treating auriferous, argentiferous, and cupreous rocks, minerals, and alluviums, parts whereof are applicable to other purposes. June 20, 1856.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," July 1st,* 1856.)

413. S. E. Sichel. Certain improvements in apparatus for weaving "ribbed" cloth and bands of "chenille." A communication.

425. T. Smith and J. Gill. Improvements in the mode or method of casing horizontal shafting.

443. W. Dawson. Improvements in machinery or apparatus for cutting paper or other materials.

457. L. Bower. New or improved machinery for the manufacture of screws.

461. J. Gedge. Improvements in preparing and combining metallic substances for producing colours, and in manufacturing the same. A communication.

463. D. Jones. Certain improvements in obtaining and applying motive power.

480. C. F. Claus. Improvements in metal ship building, applicable also to steam boilers, bridges, and other structures in which metal plates are used.

487. S. Henn and T. Haddon. Certain improvements in the mode or modes of forming or making the heads of ornamental nails when such heads are formed of a different metal or metals from the shanks of the same.

491. J. Cornes. Improvements in machines for washing and churning.

510. P. D. Margesson. Improvements in the manufacture of iron from iron ores.

513. E. T. Archer. Improvements in envelopes for the transmission of letters or parcels.
515. P. L. Grosrenaud. Certain improvements in apparatuses or furnaces for melting and puddling metals.
530. J. H. Johnson. Improvements in looms for weaving. A communication.
551. M. Samuelson. Improvements in screw propellers.
635. C. B. Normand. Improvements in the treatment and employment of steam in steam engines, and in apparatus for effecting the condensation of steam.
679. J. H. Johnson. Improvements in electro-magnetic printing telegraphs. A communication.
700. W. E. Newton. Certain improvements in cranes. A communication.
762. C. B. Normand. Improvements in steam boilers, in apparatus for applying heat to steam boilers, and economizing heat of furnaces.
791. F. Young. An improved two-wheeled open vehicle or carriage.
921. G. Lürig. Improvements in the process of manufacturing saltpetre.
1123. A. Parkes. Improvements in the use of collodion in photography.
1171. L. Cornides. Improvements in ornamental window blinds and such like transparent decorations.
1190. R. Maxwell. Improvements in the construction of taps for drawing off liquids.
1224. C. Barreswil. Improvements in gas meters.
1279. A. Drew and M. Gray. Improvements in weaving.
1342. A. Sinclair. An improvement or improvements in wrought-iron pins for railway chair fastenings.
1356. A. Stamm. Improvements in presses for packing, parts of which improvements are also applicable to other presses.
1373. T. Skaife. Spring folding camera shutters for the more speedy and convenient mode of taking photographic pictures than has been hitherto adopted.
1387. J. Combe. Improvements in machinery for carding and roving tow, and other fibrous substances, part of which improvements is applicable for transmitting motion in other mechanism.
1389. R. A. Brooman. Improvements in the manufacture of spoons, forks, and other similar articles, and in the machinery employed therein. A communication
1390. J. Eives. Improved machinery for extracting oil from oleaginous seeds. A communication.
1395. J. Stenhouse. Improvements in the preparation of a decolorising material, suitable for the treatment of acid, alkaline, and neutral solutions.
1399. W. Massey. Improvements in looms for weaving.
1400. C. J. Duméry. Improvements in machinery to be used for manufacturing shoes and boots.
1409. J. E. Machard. Improvements in printing or dyeing skeins, tissues, or other textile fabrics of cotton, wool, flax, and other fibrous substances. A communication.
1417. C. Desnos. Improvements in furnaces for consuming smoke. A communication.
1419. W. H. Barlow and W. H. Woodhouse. Improvements in connecting and securing the ends of rails of railways.
1428. J. Eives. An improved dynamometer. A communication.
1433. C. Nickels and J. Hobson. An improvement in weaving when Jacquard or other ornamenting apparatus is employed.
1437. M. A. Muir and J. McIlwham. Improvements in looms for weaving.
1439. C. E. Green. Improvements in tents, huts, and camp hospitals.
1450. W. Radley. Improvements in machinery, apparatus, materials, and processes for preparing and treating auriferous, argentiferous, and cupreous rocks, minerals, and alluviums, parts whereof are applicable to other purposes.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEARS' STAMP DUTY HAS BEEN PAID.

1559. Carlo Minasi.
1561. Auguste Edouard Loradoux Bellford.
1569. John Imray.
1570. George Arthur Biddell.
1581. William Charles Spooner.
1601. John Fall.

LIST OF SEALED PATENTS.

Sealed June 24, 1856.

1855.
2925. Charles May and Edward Alfred Cowper.
2927. Edward Alfred Cowper.
2943. Herbert Redfern.
2949. Silvester Lees, Edward Lees, and George Henry Newton.

1856.
5. William Beckett Johnson.
9. William Bullough.
26. James Frederick Lackersteen.
41. Robert Sam North and Ralph Peacock.
44. Henry Bessemer.
55. Richard Archibald Brooman.
161. Gustav Adolph Blittkowski.
193. George Brooks Pettit and Henry Fly Smith.
217. Wilhelm Dreschfeld.
244. Joseph Fowell Walton and Honore Le François.
304. Nathan Ager.
385. Edmund Morewood and George Rogers.
643. Edward Rowley and John Hadley.
684. William Henry Barlow.
860. William Warren and Warren Delarue.
912. William Little.
923. William Tytherleigh.
945. William Crosley and George Goldsmith.
954. James Hansor.
973. William Peacock Savage.
977. James Barbour.

Sealed June 27, 1856.

1855.
2938. George Chisholm.
2948. George Royds Birch.
2956. Archibald Turner.

1856.
22. John Henry Johnson.
28. Charles Marsden.
30. Henry Bach.
62. Henry Stuart and Thomas Pritchard.
116. John Abraham.
166. Peter Armand Lecomte de Fontainemoreau.
436. David Auld and John Stephen.
481. Louis Arnier.
698. William Clay.
758. James Eives.
765. Adolphe Guido.

908. Alfred Vincent Newton.
976. William Henry Balmain and Thomas Colby.
988. Walter Neilson.
1020. John Henry Johnson.

Sealed July 1, 1856.

1856.
8. Andrew Shanks.
14. Frederick Haines.
18. William Alfred Distin.
39. Joseph Betteley.
96. Alexandre Tolhausen.
123. Peter Armand Lecomte de Fontainemoreau.
197. Félix Chaucbard.
209. Alexander Dalgety.
216. Samuel Statham.
841. Charles Durand Gardissal.
1093. John Henry Johnson.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

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Schloss—Travelling-bags ... 14
Threlfall and Higson—Dressing Yarns ... 14
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LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1718.] SATURDAY, JULY 12, 1856. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

AMERICAN QUARTZ-CRUSHER AND GOLD-AMALGAMATOR.

Fig. 1. Fig. 2.

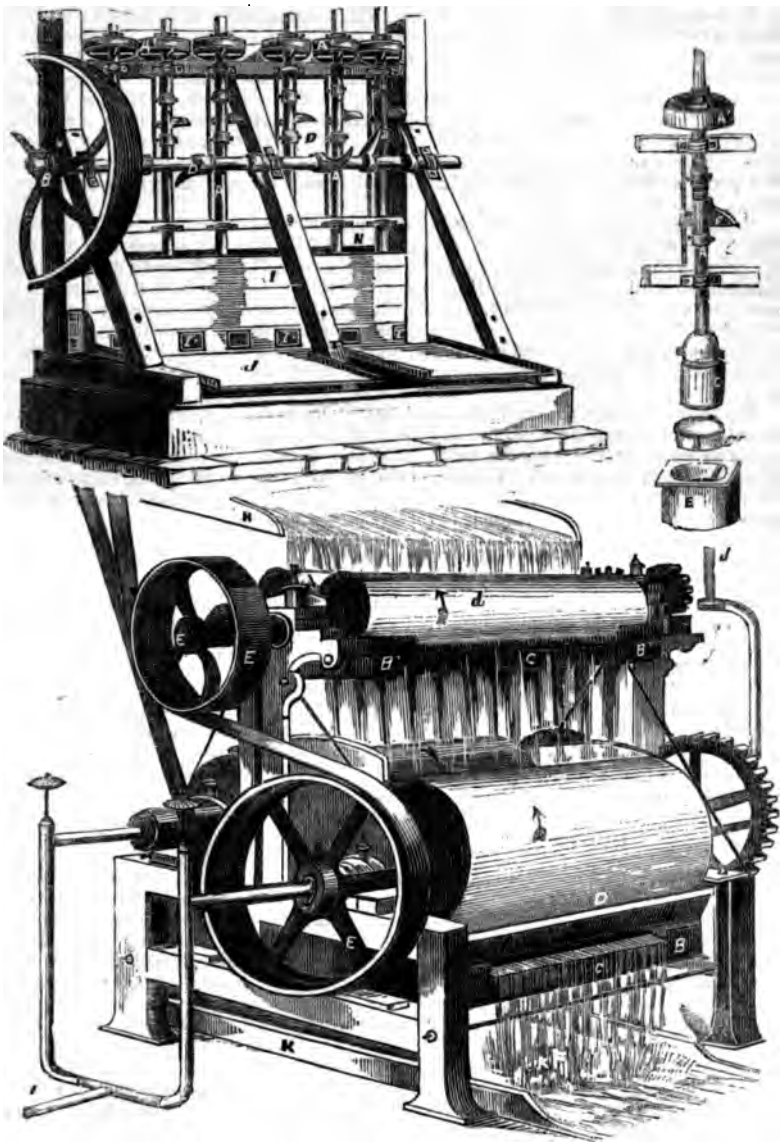


Fig. 3.

AMERICAN QUARTZ-CRUSHER AND GOLD-AMALGAMATOR.

OUR engravings (on the preceding page) illustrate the inventions of Mr. Samuel Gardiner, junior, of No. 212, Broadway, New York City. Figs. 1 and 2 exhibit the quartz-crusher, and fig. 3 the amalgamator.

In fig. 1 there is a long box, I, into which the gold bearing quartz is thrown, in lumps, to be crushed or pounded up into fine dust. The crushing is done by means of a row of pestles or stampers, and mortars, placed within the box, I. A are the stampers, furnished at their upper ends with pulleys, A', by which they are rotated; at their base (fig. 2) they have heavy stamp heads, C, and chilled plates set into the mortars, E. The stampers, C', are lifted by means of the cams, D, on shaft, B. When B revolves, the cams, D, meet the projections, F, on the stampers, lift and then drop the latter. The operation is one of great rapidity; the stampers each weigh, with their heads, 650 lbs., so that their crushing power is very great. The quick revolving motion given to the stampers, at the same time that they rise and fall, tends to grind the quartz, and assist the pulverization. A constant stream of water flows into the box, I, which escapes and carries with it the quartz as fast as it becomes sufficiently pulverized, through the gauze apertures, or sieves, I', on to the inclined plane, J.

From the inclined plane, J, the quartz dust and water are conveyed to the amalgamator (fig. 3), entering through the inclined spout, H, and falling upon the amalgamating rollers, *d*, and from them upon the larger amalgamating rollers, D. B B are troughs containing quicksilver, in which the rollers, *d* D, respectively rotate, and thus have their surfaces kept continually coated with mercury; the quartz-water is thus doubly brought into contact with the quicksilver, and complete amalgamation takes place. Below the machine is an inclined plane, K, called the ripple-box, upon which the water falls, after leaving the lower cylinders. Should any gold remain in the water, it will be arrested by the pockets in K.

The large cylinders, D, are hollow, and heated by means of steam introduced through their journals from steam pipe, I. The effect of the heat is to render the mercury more active in amalgamating with the gold. If heated to 212°, the mercury will absorb five times more gold than at 60°. This shows the importance of warming the cylinders. We do not remember to have seen any other amalgamating machine in which practical advantage is taken of the above-mentioned property of quicksilver.

We are told that the quartz-dust can be exposed to over 6,000 square feet of quicksilver surface per minute in one of these machines; this is on a calculation of forty revolutions per minute for the large cylinders, and includes the surface presented by the quicksilver in the troughs, while the quartz-water passes through the same. The ore and water pass between and under the cylinders in a thin sheet, which is regulated by a set screw: this also gauges the amount of ore desired to pass through the amalgamator. Ten tons of ore, it is said, can be amalgamated per day by a single machine.

The crusher, with six stampers, we are informed, will reduce a tun of quartz per hour. The revolving motion of the stamper heads causes them to wear evenly; when too much worn they may be taken off, each separately, and a new one put on, without stopping the machine; each stamper is arranged independently of the others.

The inventor states that this invention has been thoroughly tested at the mines.—*Scientific American.*

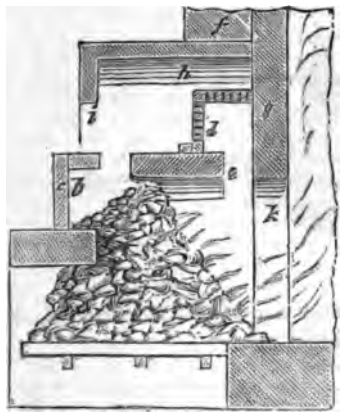
DOULTON'S SMOKELESS POTTERY KILNS.

IN our Number for May 31st, (No. 1712) we gave a short illustrated description of an arrangement for improving the combustion of fuel in pottery kilns, the invention of Mr. Doulton, of Lambeth. We have since had submitted to us a modification (shown in fig. 2) of that arrangement, which has been found to still further improve the results obtained. In this arrangement no fire bars are employed. As the description in the former article was slightly imperfect, we will here give the invention in a complete form.

Fig. 1 is a section of a fire-place or furnace *of a kiln where fire bars are used*; and fig. 2 is a section where no fire bars are employed. *a* is the fire-place or furnace, into which the fuel is placed through the opening *b*, to facilitate which the tile or slab *c* is taken away, and then replaced; *d*, *d*, are perforated fire tiles over an opening *e*, at the upper part of the fire-place or furnace: *f* is part of the outer wall of the kiln; *g* is part of the lining of the kiln; *h* is a chamber above the perforated fire tiles, which can be partially closed by introducing a tile or brick, or otherwise, at the opening *i*, to reduce the quantity of air passing into the chamber *h*, (and consequently to the fire), when the coal has become well ignited.

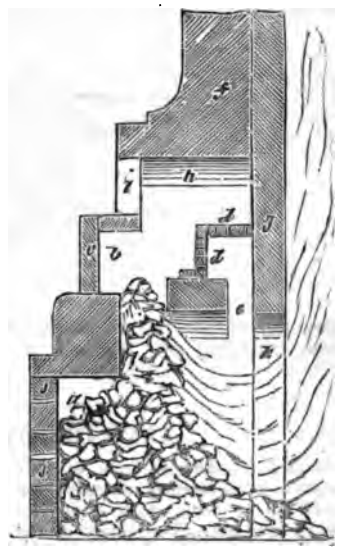
There may be further perforated tiles used above those shown to partially heat the air before it comes to them. *j*, *j*, are bricks

Fig. 1.



piled, as heretofore, loosely at the lower part of the furnace or fire-place, as shown, between which air can pass to support combustion, as well as down through the fuel from the chamber *h*. By these arrangements the perforated tiles *d*, *d*, will become highly heated, and the atmospheric air will become heated in passing from the chamber *h*, downwards through the perforated tiles into the upper part of the furnace or fire-place, and will enter above the fuel therein, and thence pass into the kiln

Fig. 2.

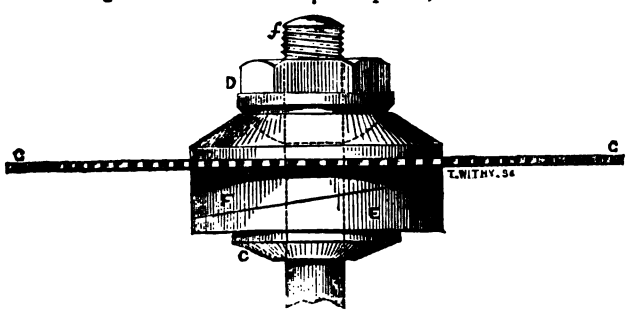


through the opening *k*, where it will meet with the products passing off from the fuel, and become ignited with them as they enter the kiln.

HIGHFIELD AND HARRISON'S ADJUSTABLE CIRCULAR SAW.

This invention consists in securing a circular saw to its spindle in an oblique direction, so as to make a saw of the common construction to cut grooves or rebates of any required widths. This is effected in the following manner:

Between the saw, G G, and collar, C, on the spindle, are two bevilled washers, E F,

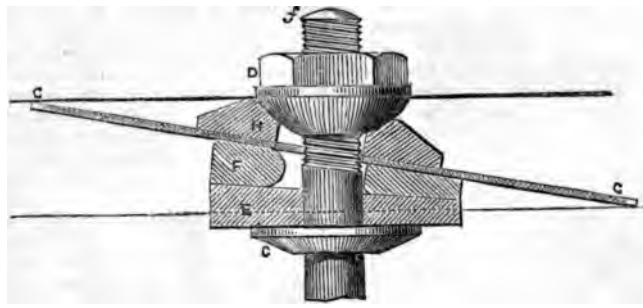


each capable of being turned round independently of the other; and on the opposite side is a plain washer, H, having a concave recess for receiving a convex nut, D, which screws on to the end of *the spindle, and secures the saw firmly thereto. The whole is* so arranged that by changing the relative positions of the two bevilled washers, E and F, a surface more or less oblique with the axis of the spindle is presented for the saw to be screwed against. The obliquity of the saw with the axis of the spindle may

be varied at pleasure, and grooves or rebates of various widths cut into the wood submitted to its action.

This is a most ingenious contrivance, and will save the great expense of having saws made to the thickness of the rebate required.

The invention has been patented by Mr.



Henry Laxton, as a communication from Messrs. Highfield and Harrison, of the United States.—*Civil Engineer and Architect's Journal.*

LEA'S IMPROVED TAPS AND COCKS.

Messrs. W. and J. Lea, of Wolverhampton, have recently patented an improved tap or cock which is coming into very general use. The object of the improvement is, that the fluid way of the tap or cock may be inspected and cleaned. For this purpose the front part or "nose" is formed so that it may be screwed off and on the body; or an aperture is formed in the front, and a screw plug fitted into it.

Fig. 1 of the accompanying engravings is a side elevation, partly in section, of a tap formed so that the nose may be screwed off and on the body. The inner surface of the back part of the nose is threaded, and takes into a corresponding thread on the front of the body of the tap.

Fig. 2 is a section of another tap in which the "nose" does not unscrew, but in which access is gained to the fluid way through a channel in front of the tap, which is formed with a screw thread for the reception of a correspondingly threaded plug.

Fig. 1.

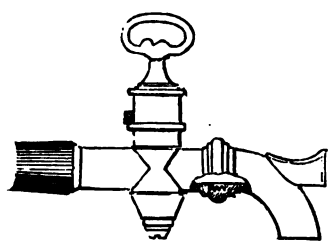
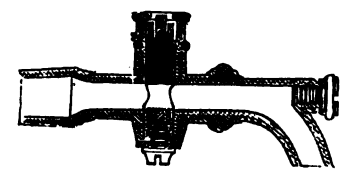


Fig. 2.



RAILWAYS IN THE UNITED KINGDOM.

The report of the railway department of the Board of Trade for the year 1855 states that the number of railway bills which came before Parliament in the session of 1855 amounted to 104, and the length of new line *proposed to be authorized* amounted to 655 miles. But of these bills only 73 were passed; and the total length of line actually authorized was 363 miles. Of the 73 acts passed in 1855, 53 had reference to the construction of works; the length of new line authorized by these acts was as follows, viz.:

196 miles in England and Wales, 76 miles in Scotland, and 91 miles in Ireland.

The number of persons employed on the 30th of June, 1855, upon the railways in course of construction amounted to 38,546, being on the average 43·8 per mile. In June, 1849, when 1,504 miles of railway were in course of construction, 103,816 persons were employed upon them, or 69 persons per mile; in June, 1850, 864 miles were in course of construction, and 58,884 persons were employed on them, or 68·15 per mile; in June, 1851, 734 miles were in course of construction, and 42,938 persons were employed, being at the rate of 58·49 persons per mile; in 1854, 889 miles were in course of construction, and 45,401 persons were employed upon them, being at the rate of 51·07 per mile. The money raised by shares and loans for the construction of railways in 1849 amounted to 29,574,719*l.*; in 1850, to 10,522,967*l.*; in 1851, to 7,970,151*l.*; in 1852, to 15,924,783*l.*; in 1853, to 9,158,835*l.*; in 1854, to 12,452,374*l.*; and in 1855, to 11,514,490*l.*, making together in seven years a total of 97,118,319*l.*, being at the rate of 32,000*l.* per mile for the length of railway opened during that period. The number of persons employed on railways open for traffic in the United Kingdom was, in 1851, 63,563, being at the rate of 9·49 per mile; in 1852, 67,601 persons, or 9·55 per mile; in 1853, 80,409, or 10·7 per mile; in 1854, 90,409 or 11·59 persons per mile; and in 1855, 97,952 persons or 12·07 per mile. The number of stations in 1851 was 2,107, and in 1855, 2,798; showing an increase of 691 stations and of 1,418 miles of railway.

A Catechism of the Steam Engine in its various application to Mines, Mills, Steam Navigation, Railways, and Agriculture; with Practical Instructions for the Manufacture and Management of Engines of every Class. By JOHN BOURNE, C.E. Fourth Edition, greatly enlarged and improved, and illustrated by eighty-nine Wood Engravings. London: Longman, Brown, and Co. 1856.

(*Concluded from p.* 12.)

THERE are few things to which men of considerable intelligence are more prone, when unrestrained by severe logical training, than to *explain* the phenomena they meet with, or have reported to them, by means of some favourite hypothesis or hypotheses of their own. And as it is an eminently easy thing to pursue this work of explanation of matters often apparently paradoxical when compared amongst themselves, by the use of conflicting suppositions, the inconsistency of which is overlooked; and as it is correspondingly difficult to show the compatibility of the facts by a correct method, the would-be-doctors of natural science adopt the former and eschew the latter mode of prosecuting their simplifications. Of course it would not lie in our province to comment on this tendency, if its possessors confined themselves to amateur attempts to enlighten their own immediate circle; but when a work is published for the benefit of all, and especially when that work is intended as an elementary textbook for beginners in a branch of knowledge, we must protest against the introduction into it of "theories" which have not received the sanction of some considerable experience, and stood the test of strict examination. We think it much to be recommended, even to those who do not or cannot seize an opportunity of thrusting their views before the public, to cultivate a consciousness of their want of knowledge on doubtful points, rather than to deceive themselves with false or even *doubtful* explanations of them. This seems to us, indeed, to be a duty they owe themselves. But, in the case of the author who writes for public instruction, we are constrained to regard the opposite manner of treating his subject, as an infringement of a duty which he owes to others. But, to come to the immediate subject to which these remarks relate, we cannot help observing that, if Mr. Bourne had contented himself with teaching what he knows, and not endeavoured to inform his readers on subjects of which he is ignorant, and of some of which, indeed, everyone is so too, his book would have been, we doubt not, a very deserving one, and not the less so from being, as it certainly would have been, much less bulky than the one before us. To his readers we would say, "Do not mistake his explanations or his deductions, where you have no independent means of testing them, for established truths." This advice we shall justify by showing that Mr. Bourne has not only not taken proper care to exclude from his work theories and alleged facts which are exceedingly doubtful, but that he has admitted into association of equality with more worthy matter very much that is demonstrably false. This, of course, vitiates the whole, as designed for the enlightenment of the ignorant, because an ignorant lad knows no standard of excellence whereby he may choose the good and avoid the evil.

A few extracts from the chapter on Steam Navigation will serve to illustrate our remarks and show their justice. On the subject of resistance we have the following:

"537. *Q.* Is the whole power expended in the propulsion of the vessel consumed in moving aside the water to enable the vessel to pass?

"*A.* By no means; only a portion, and in well-formed vessels only a small portion of the power is thus consumed. In the majority of cases, the greater part of the power is expended in overcoming the friction of the water on the bottom of the vessel; and the problem chiefly claiming consideration is, in what way we may diminish the friction.

"538. *Q.* Does the resistance produced by this friction increase with the velocity?

"*A.* It increases nearly as the square of the velocity. At two nautical miles per hour, the thrust necessary to overcome the friction varies as the 1·823 power of the velocity: and at eight nautical miles per hour, the thrust necessary to overcome the friction varies as the 1·713 power of the velocity. It is hardly proper, perhaps, to call this resistance by the name of friction; it is partly, perhaps mainly, due to the viscidity or adhesion of the water."

That part of the resistance to the motion of a body through water is due to friction, and a *small* part to the adhesion of the water particle to particle, we see no reason to doubt; but how to separate these from the direct resistance, so as to pronounce the two, when taken together, to be the greater part of the aggregate resistance, Mr. Bourne does not tell us, though the results of such pretended analysis he does give us. In this case, we believe both his analysis and his results unworthy of confidence, and without any foundation in reason or in experiment, though we should like to know by what process the results are reached. If the author has no better reasons for his conclusions than that given in the end of the following extract, we think he must have taken some care that all *natural connection* between the propositions which he throws together as premises and conclusion, should be avoided.

"541. *Q.* Discarding for the present the subject of friction, and looking merely to the question of bow and stern resistance, in what manner should the hull of a vessel be formed so as to make these resistances a medium?

"*A.* The hull should be so formed that the water, instead of being driven away forcibly from the bow, is opened gradually, so that every particle of water may be moved aside slowly at first, and then faster, like the ball of a pendulum, until it reaches the position of the midship frame, at which point it will have to come to a state of rest, and then again, like a returning pendulum, vibrate back in the same way, until it comes to rest at the stern. It is not difficult to describe mechanically the curve which the *water should pursue. If* an endless web of *paper be put into uniform motion*, and a pendulum, carrying a pencil or a brush, be hung in front of it, then such a pendulum will trace on the paper the proper water-line of the ship, on the line that the water should pursue in order that no power may be lost except that which is lost in friction. It is found, however, in practice, that vessels formed with water-lines on this principle are not much superior to ordinary vessels in the facility with which they pass through the water; *and this points to the conclusion that, in ordinary vessels of good form, the amount of power consumed in overcoming the resistance due to the wave at the bow, and the partial vacuity of the stern, is not so great as has heretofore been supposed, and that, in fact, the main resistance is that due to friction!*"

It appears here to be assumed that the resistance to the curve described by the pendulum, as pointed out in the above passage, would, if it had not the constant character of friction, be reduced to almost nothing; but as such a diminution is not found to happen in practice, Mr. Bourne is led to conclude that the principal part of resistance is due to friction: we are quite unable to follow him in this step in his argument. It is certainly very difficult, and we think impossible, to find any necessary relation between his premises and his conclusion, even if his assumption could be supposed correct. Again; it is quite as impossible to discover what the curve alluded to can have to do with the subject of resistance at all. It is, we doubt not, an entire mistake on Mr. Bourne's part; and no doubt he would be as much puzzled as ourselves to assign any reason whatever for the supposition which he treats as a demonstrated truth. Indeed, facts will not bear out the notion that friction constitutes the main portion of the resistance to a vessel's motion; for if such were the case, the resistance would vary as the weight of the ship principally, and slightly, perhaps, with the surface immersed; at least so we should expect.

Another passage, of which the demerits are worthy of being exhibited, is the following:

"549. *Q.* Will large vessels attain a greater speed than small, supposing each to be furnished with the same proportionate power?

"*A.* It is well known that large vessels, furnished with the same proportionate power, will attain a greater speed than small vessels, as appears from the rule usual in yacht races, of allowing a certain part of the distance to be run to vessels which are of an inferior size. The velocity attained by a large vessel will be greater than the velocity attained by a small vessel of the

same mould and the same proportionate power, in the proportion of the square roots of the linear dimensions of the vessels. A vessel, therefore, with four times the sectional area and four times the power of a smaller symmetrical vessel, and consequently of twice the length, will have its speed increased in the proportion of the square root of 1 to the square root of 2, or 1·4 times."

This is altogether wrong. Two such vessels, with power so proportioned, if anything at all can be said of them, would be propelled at precisely the same speed. Any comment upon this question must be founded on the principle that, in similar vessels, propelled by similar power, under similar circumstances, the power varies as the cube of the velocity multiplied by the area of the immersed midship section. If, then, we take one vessel having a midship section, whose immersed area is A, in which a velocity, v, is generated by a power, P, and another in which the quantities are respectively A′, v', and P′, the cases being similar in all respects as above, then we have

$$\frac{P}{P'} = \frac{Av^3}{A'v'^3}$$

Now, if the powers be proportioned to the area of the section, as is supposed by Mr. Bourne in his example, then we have

$$\frac{P}{P'} = \frac{A}{A'}$$

$$\text{and } \therefore v' = v$$

the velocities are equal. But if the power be supposed to vary as the capacity of the vessels, and l, l' be their lengths, then we should have the additional conditions

$$\frac{P}{P'} = \frac{l^3}{l'^3},$$

$$\frac{A}{A'} = \frac{l^2}{l'^2};$$

and our first equation becomes

$$\frac{l^3}{l'^3} = \frac{l^2}{l'^2} \cdot \frac{v^3}{v'^3},$$

$$\text{or } \frac{l}{l'} = \frac{v^3}{v'^3},$$

$$\text{and } \frac{v}{v'} = \sqrt[3]{\frac{l}{l'}};$$

that is, the velocity varies as the cube root of the linear dimensions, and not as the square root of the same, as stated in the above extract. The same blunder is repeated in an example in the answer to the next question, which shows that the error is no mere slip, but an *established part of Mr.* Bourne's scientific creed. We will transcribe it also for our readers' benefit:

"The screw steamer *Fairy*, if enlarged to three times the size while retaining the same form, would have twenty-seven times the capacity, nine times the sectional area, and nine times the power. The length of such a vessel would be 434 feet; her breadth, 63 feet 4½ inches; her draft of water, 16½ feet; her area of midship, 729 square feet; and her nominal power, 1,080 horses. Now, as the lengths of the *Fairy* and of the new vessel are in the proportion of 1 to 3, the speeds will be in the proportion of the square root of 1 to the square root of 3; or, in other words, the speed of the large vessel will be 1·73 times greater than the speed of the small vessel. If, therefore, the speed of the *Fairy* be 13 knots, the speed of the new vessel will be 22·49 knots, although the proportion of power to sectional area, which is supposed to be the measure of resistance, is in both cases precisely the same. If the speed of the *Fairy* herself had to be increased to 22·49 knots, the power would have to be increased in the proportion of the cube of 13 to the cube of 22·49, or 5·2 times, which makes the power necessary to propel the *Fairy* at that speed equal to 624 nominal horses."

These extraordinary results do not seem to surprise their author in the least, though we believe they would have made most men conclude that some mistake must have been made in the process by which they were obtained. There are two similar vessels driven at the same speed, one being twenty-seven times as great as the other, yet having less than double the power. But we will transform these cases a little, according to principles admitted and laid down by Mr. Bourne himself. Suppose this large vessel to receive, instead of the engines of 1,080 horses power, others equal in power to those of the *Fairy*; then Mr. Bourne would say her velocity would be

$$22{\cdot}49 \sqrt[3]{\frac{120}{1080}} \text{ or } 10{\cdot}8,$$

that is, if engines of 120 horses power would propel the *Fairy* 13 knots, then the same engines would propel a similar vessel of twenty-seven times the capacity, at the speed of 10·8—nearly eleven knots—a result countenanced neither by theory nor by experiment. Passing over many passages for which, though worthy of notice, we have not space, the following takes our attention:

"If the screw be properly proportioned to the resistance that the vessel has to overcome, the slip will not be more than 10 per cent., but in some cases it amounts to 30 per cent., or even more than this. In other

cases, however, the slip is nothing at all, and even less than nothing; or, in other words, the vessel passes through the water with a greater velocity than if the screw were working in a solid nut."

"568. *Q.* Then it must be by the aid of the wind, or some other extraneous force?

"*A.* No; by the action of the screw alone.

"569. *Q.* But how is such a result possible?

"*A.* It appears to be mainly owing to the centrifugal action of the screw, which interposes a film or wedge of water between the screw itself and the water on which the screw reacts. This negative slip, as it is called, chiefly occurs when the pitch of the screw is less than its diameter, and when, consequently, the velocity of rotation is greater than if a coarser pitch had been employed. There is, moreover, in vessels passing through the water with any considerable velocity, a current of water following the vessel, in which current, in the case of a screw vessel, the screw will revolve; and in certain cases the phenomenon of negative slip may be imputable in part to the existence of this current."

In the above passage the ignorant lad who plays the part of questioner has decidedly the best of the argument. There can be no doubt in any well-regulated mind that wherever a vessel impelled by screw alone is proceeding uniformly through the water, negative slip is quite impossible, under any circumstances of pitch and diameter of propeller. There is no doubt that the vessel in moving on her course is constrained to exert some amount of force upon the water which impedes her course, in order to effect her passage through it, so that a quantity of water has motion communicated to it in the direction of the ship's course, and this is continually going on at the bows, so long as the vessel is moving onward uniformly. There is, therefore, a force tending to destroy the motion of the ship, and which would actually destroy it if it were not prevented, by an equal amount of force being communicated to the vessel in the opposite direction, and this in consequence of an equal amount of motion or momentum being impressed upon the water in exactly the opposite directions. The equilibrium which obtains under such circumstances is of this kind; the momentum impressed on portions of water by the motion of the vessel in the direction of that motion must be exactly equal to the momentum imparted to other portions of the fluid in the opposite direction. And if the form of the vessel be such as to cause a *stream* of water to flow after her in her *wake, this will not be calculated to* diminish the momentum needful to be generated in the opposite direction, but will, on the contrary, increase it; for it is an effect of the propeller only to be accounted for by the momentum generated in the reverse direction by the propeller, being greater than that imparted to the water by the bows. In the same propeller, the greater the slip the greater is the momentum generated in the reverse direction, so that the more calculated a vessel is to create a following stream in her wake, the greater will be the positive slip in her case at a given velocity with a given screw; for there must be as much positive slip as to generate positive reverse motion sufficient to counterbalance both this following stream and the momentum generated at the bows.

We do not see the justice of the following passage: "The amount of reacting power of the screw upon the water is not measured by the number of square feet of surface of the arms, but by the area of the disc or circle in which the screw revolves." Such a measure is certainly an inaccurate one, unless other circumstances of pitch and length be also taken into account.

Mr. Bourne gives an opinion of the advantage of using steam and sails in conjunction, which is not so free from objection as the teachings of an elementary work ought to be. We extract the passage containing his views on the subject.

"610. *Q.* Does the screw act well in conjunction with sails?

"*A.* I cannot say it acts better than paddles, except in so far as it is less in the way and less affected by the heeling over of the ship. A small steam power, however, acts very advantageously in aid of sails; for not only does the operation of the sails in reducing the resistance of the hull virtually increase the screw's diameter; but the screw, by reducing the resistance which has to be overcome by the sails, and by increasing the speed of the vessel, enables the sails to act with greater efficiency, as the wind will not rebound from them with as great a velocity as it would otherwise do; and a larger portion of the power of the wind will also be used up. In the case of beam winds, moreover, the action of the screw, by the larger advance it gives to the vessel, will enable the sails to intercept a larger column of wind in a given time. It appears, therefore, that the sails add to the efficiency of the screw, and that the screw also adds to the efficiency of the sails."

The use of the word "therefore," in the concluding sentence of the above, seems to indicate that the passage is, in its author's esteem, a thorough demonstration. We cannot help differing from him in so regarding the reasoning. If it were true that

wind and steam, acting conjointly in the propulsion of a ship, augmented each other's efficiency, it would still be very certain that the features of the case, except given by Mr. Bourne, that of the diameter of the screw have nothing whatever to do with any such effect. What advantage can it be to diminish the velocity with which the wind rebounds from the sail, unless it be an advantage to lessen the pressure of the wind on them? Again: Can the passage of the sails through a large column of wind increase the sailing efficiency of the vessel? Suppose the vessel were made by the screw to go so fast as to keep up with the wind, and so prevent all pressure of the sails, would that increase the efficiency of her sails? We should think that in this last case the efficiency of the sails would be altogether destroyed, though it would be under such circumstances, that the greatest possible column of air would be intercepted without making the sails worse than useless. It may be objected that, theoretically, a beam wind cannot be overtaken; but it is still practically true that the velocity of a ship under steam and sail, with the wind on her beam, may, with some velocities of wind, have her speed so increased by her steam power as to render the sails utterly ineffective.

We are sorry Mr. Bourne has not excluded from a work, which he had the power of making much more valuable than it is, matter which vitiates the whole, as it makes the book unworthy of that confidence which a treatise, written in its somewhat dogmatic style must have, if it claim to be of any considerable value, and of any general use.

The Language of Specifications of Letters Patent for Inventions: with the Authorities and Decisions in all the more Important and Latest Cases. By JOHN MACGREGOR, Esq., of the Inner Temple, Barrister-at-Law. London: W. G. Benning and Co., Law Booksellers, 43, Fleet-street. 1856.

OF the utility of such a work as this, if well executed, no one, who has a moderate acquaintance with the specifications of patents filed from day to day, can doubt. It is, therefore, gratifying to find that the preparation of it has been undertaken by a gentleman so well qualified as Mr. Macgregor to deal efficiently with the subject.

IN order to determine what is, or is not, suitable language to be employed in specifications of patents, it is not sufficient to consult the Patent Law Amendment Act, or to ascertain the sense in which scientific and other terms are used in schools and colleges, since the required guidance is not to be gained from either of these sources. It is necessary to revert to the practice of persons experienced in patent matters, and to the decisions of the courts in those patent cases which have from time to time been adjudicated upon. This is what the present author has done, and having carried very considerable industry and skill to the task, he has succeeded in producing a treatise, which but few who are concerned with the preparation of patent specifications will do well to be without.

Our space will not permit us to speak at length of the work, but we consider it highly desirable to direct attention to that portion of it which treats of the "claims" made in specifications. It has been the practice with many persons to attach but little importance to these; Mr. Macgregor shows the danger of this course, and places the whole subject very clearly and fully before the reader. The whole treatise should, however, be carefully perused and studied.

THE BRUSSELS ECONOMIC EXHIBITION.

OUR readers will be glad to learn that, as the time for the opening of this Exhibition approaches, the merchants and manufacturers of this country are evincing an increasing interest in it, and making the necessary arrangements for producing an interesting and useful display of such of their manufactures as are applicable to the objects in view. Catalogue-forms, &c., are to be had at Messrs. Mertens, Trupel, and Co., 8, Catherine-court, Seething-lane, London, the Agents of the Belgian Commission.

THE STEAM ENGINE AND ECONOMY OF FUEL.

To the Editor of the Mechanics' Magazine.

SIR,—Engineers are aware that up to the present time there is no such thing as a precise rule for the proportions of steam engine boilers, and they will probably be not a little surprised when I say that the action of the engine depends far more on these proportions than on the details forming what is usually called the engine. It has been considered of no consequence to determine the volume of the water in the boiler with reference to anything beyond the risk of explosion, whereas, I assert that too much importance cannot be given to this point. Engineers now acknowledge that an economy of fuel arises from using steam expansively, a greater duty being obtained from a greater steam pressure.

The Cornish engine, erected in London, demonstrated this gain as compared with an engine such as Watt left it. A true explanation of this gain has, however, never been arrived at. Pambour justly remarked that the theory of the steam engine had not as yet been explained, and many books have been written since his time, but without making a single step in advance. Authors differ so much on this subject that it is difficult to know which to credit, and yet the matter seems simple when the following known properties of water and steam are duly considered.

Watt, Christian, and several others agree that equal quantities of water are evaporated in equal times, by the same fire, under any constant pressures or temperatures.

One cubic foot of water can be converted into steam in an hour by 8·4 lbs. coals; and 1·4 lbs. coals can raise the same quantity of water 180° Fahr.

The volume of high pressure steam is slightly greater, proportionately, than that of low pressure steam, as compared with the water from which it is produced.

The total heat in steam is nearly the same at all pressures when in contact with the water. Regnault shows an increase of 45° Fahr. from a pressure of 15 lbs. per in. to one of 200 lbs.

Isolated steam expands $\frac{1}{480}$th for every additional degree Fahr.

Vapour is formed from water at all temperatures; water boils at 70° in a vacuum, and at 212° under atmospheric pressure.

If a vessel containing water at 70° is placed over a flame, the water will gradually rise in temperature until ebullition commences. Water evaporates very slowly when under a pressure greater than that corresponding to its temperature, and it will be found to have lost scarcely anything in weight whilst rising from 70° to 212° If the flame is constant, a certain time will be required to raise the temperature of the water from 70° to 212°, and during this time the water will have partaken of 142°. On the water commencing to boil, take away the flame and open a communication between the steam space and a condenser, when the water will continue to boil until lowered to its original temperature, and will evaporate as much water as the flame was capable of converting under any constant pressure in the same time. Of course I do not here take into consideration what is lost by radiation, and what follows is to be understood as on the supposition of the non-existence of this source of loss. If the communication is *now partly closed and* the flame again applied, the water will continue to boil and to increase in temperature at the same time, provided the steam does not get beyond the pressure corresponding to the temperature of the water; in other words the temperatures of the steam and water should exactly coincide. The water will in this case partake of the same quantity of heat in the same time as before, and in addition an equivalent quantity of steam will also be generated, so that there will be heat in the water and also in the steam. It is assumed that the flame is regular and gives out a constant amount of heat in equal times, and as in the second case a double amount of heat was taken up in a given time, less of it was allowed to pass to other bodies. If water is not in a condition to receive and retain or transmit the whole of the heat directed or applied to it, some of this heat must pass to other bodies. I have, by several experiments, ascertained that water will only receive heat in accordance with certain laws, and I have found that with a given flame, in a given time, I could evaporate double the quantity of water in one case that I could in another.

As notes of some of my experiments may assist in elucidating the points to which I wish to call attention, I will give them.

Having procured a small vessel, something in the shape of a bottle, with a cock at the neck, I filled it about two-thirds full of water, and suspended it over a gas flame with the cock open. After the water had commenced to boil, I closed the cock, and the ebullition immediately ceased, as was easily known by the cessation of the vibration of the vessel previously caused by the boiling action. The noise was like that before the water reached the boiling point, a steam bubble now and then breaking in the steam space, this being more easily heard as the pressure increased. I then took a glass phial, and tried the same experiment; and observing the surface of the water, saw that the water ceased to boil immediately on the cock being shut. The cock was secured to the phial in a ferrule made of tin plate. Instead of using the gas flame, I placed the phial in a bath of boiling oil. This experiment satisfied me that the water could not boil under an increasing temperature, if the steam space was so small that the steam at first generated increased the pressure above that corresponding to the temperature of the water. In an experiment, which I shall call No. 3, I added to the vessel used in experiment No. 1 a small vessel or receiver, the cock already mentioned being between the two, and another cock being attached to the receiver. This duplex vessel was weighed with a cer-

tain quantity of water in it, and on reaching the boiling point was again weighed, when little or no difference in weight appeared. A spring balance was used, indicating drachms. After setting the gas flame at a certain distance from the bottom of the boiler or lower vessel, so that no smoke adhered to the vessel, it was regulated so as to evaporate one ounce of water in five minutes under atmospheric pressure, the experiment being frequently repeated to make sure that the gas flame was regular. Afterwards the boiler and gas flame being adjusted precisely as before, the water was raised to the boiling point. On reaching this, the cocks were shut, and every now and then (about thirty times in five minutes) opened in turns. First, the lower cock between the two vessels was opened as soon as one and a half minutes had elapsed; the water was relieved immediately, and boiled rapidly; then the lower cock was shut and the upper one opened, and this repeated for five minutes. The vessel was then weighed, and it was found that 1¼ to 1½ ounces had been evaporated. This experiment was a failure, in consequence of the water in the lower vessel being thrown into the receiver; and at the last trial in three minutes the bottom was burning, and almost the whole of the water was found in the receiver, the steam generated in the boiler being able to keep up the water which was thrown up on relieving the pressure by opening the cock. A pipe fitted with a stop-cock was then added to the apparatus forming a communication between the upper portions of the two vessels, and the experiment was repeated. On opening the side pipe, the water fell down into the boiler. I made the steam space in the boiler more and the water space less, and so soon (every two or three seconds) as the water ceased to boil, I opened the lower cock, and then the side pipe, thereby equalizing the pressure on the surface of the water; I then shut both, and gradually opened the upper cock communicating with the atmosphere. On repeating this experiment several times in succession, I found I could evaporate 50 per cent. more water on an average, and at some trials 100 per cent. more than was evaporated under atmospheric pressure. I then took the glass phial used in experiment No. 2, and weighed it with a certain quantity of water in it; and so soon as the water began to boil, I partially closed the cock, and as the water boiled less violently opened it a little more. I then withdrew the flame, and allowed the water to boil without it; and in every experiment I got nearly twice as much water evaporated with a given application of heat as under atmospheric pressure. My experiments led me to conclude that I could make a given fire evaporate in a given time twice as much water under certain conditions as it would do under other conditions.

I thereupon set to work to design an engine to utilize this power, and in doing so, found the Cornish engine to be the best existing engine for attaining this result. Thus was the cause of the great economy of the Cornish engine made clear to me. The time in getting up the pressure in a Cornish boiler is ten or more times that during which it is taken away. The steam space, therefore, bears such a relation to the water space that the quantity of coal burnt to raise the temperature of the water, say 2°, is nearly that necessary to generate steam so as to fill the steam space at a corresponding pressure. The Cornish engineers have arrived at this proportion by the mere copying of successful but untutored practice, otherwise a rule would have been handed down to us for determining the proportions of the steam and water spaces in all cases. The Cornish engineers, by placing flues within their boilers, have reduced the volume of water until they have nearly arrived at the proper proportions for the steam and water spaces for the degree of pressure and of expansion adopted. The whole cause of the gain in the Cornish engines has been assigned to the unexplained action of expanding steam in a cased cylinder; but I doubt not all practical engineers will agree with me that it is difficult to see why. The higher the pressure of steam, the greater is the economy of the fuel if the steam is used expansively. I will endeavour to show how these higher pressures produce a gain. Tredgold says that eight times the volume used for one stroke of the engine, cutting off at half stroke, is sufficient for steam space in the boiler. Other authors say from ten to fifteen times. I will suppose it to be ten times, with the cylinder capacity two cubic feet, so that when cutting off at half stroke, one cubic foot is required for each single stroke. Suppose the engine makes 100 single strokes per minute, that the cylinder is 2 feet long, and that the boiler is a common round one; 10 cubic feet are required for steam space, and say double that for water—this being a common proportion in small engines.

It requires 8·4 lbs. coals to convert a cubic foot of water into steam, and 6000 cubic feet of steam are required per hour, which, at a pressure of 30 lbs., is 883 times the water which produced it, so that about 7 cubic feet of water is required per hour.

Then $8{\cdot}4 \times 7 = 58{\cdot}8$ lbs. per hour.

$$\frac{58{\cdot}8}{60} = {\cdot}98 \text{ lbs. per minute.}$$

$\frac{\cdot 98}{100} = \cdot 0098$ lbs. per stroke.

$\frac{\cdot 0098}{2} = \cdot 0049$ lbs. per half stroke.

If 1·4 lbs. coals raise 1 cubic foot of water 180°, ·0049 lbs. will raise 20 cubic feet ·031°, which would convert 1 cubic inch of water into steam; 2 cubic inches are required for each single stroke, these 2 cubic inches making 1 cubic foot of steam. On giving steam, the pressure in the boiler would be lowered 3 lbs. by the abstraction of a cubic foot of steam. The caloric in the water set free by the reduction in the pressure causes the generation of as much steam during the first half of the stroke as the water took heat from the fire during the last half of the previous stroke, which is, as already mentioned, ·031°, or 1 cubic inch of water converted into steam. During this time also (the first half of the stroke) the water boils or evaporates 1 cubic inch of water, and at the same time takes ·031° of heat from the fire. The first half of the stroke is now accomplished, and the boiler is at the same temperature, with the same volume therein, as we had at the commencement of the stroke. The supply being cut off, the water ceases boiling; but, during the last half of the stroke, again takes ·031° from the fire; this being equivalent to the conversion of 1 cubic inch of water into steam. We have thus, theoretically, 50 per cent. more steam for the next stroke from a given quantity of fuel than if the engine worked inexpansively. If this engine is now altered, and the valve set to cut off at one-fourth of the stroke, the steam pressure being raised to 60 lbs. in the boiler, the steam will be taken from the boiler during half as long a time as in the other case, causing, however, the same reduction in the boiler pressure, viz., 3 lbs., which is the production of 2 cubic inches of water, whilst the boiler has three-fourths of the time of the whole stroke to increase in temperature. As 50 per cent., we said, was gained in the first case, an additional 50 per cent. will obviously result in this second case, making 100 per cent. in all, as compared with an engine working inexpansively, seeing that the difference in temperature between the pressure of 57 lbs. and 60 lbs. is less than that between those of 27 lbs. and 30 lbs.

I will now consider the action of a different engine and boiler from the first, but one calculated to burn the same amount of fuel in the same time. The cylinder of this new engine is, we shall suppose, of a capacity of 4 cubic feet, and the valve is set to cut off at half stroke. The boiler has a capacity for steam of 30 times the volume required for each single stroke of the engine, or 15 times the capacity of the cylinder. The pressure is 30 lbs. per square inch. The boiler has two or more flues, making up the same amount of heating surface as in the former example; but the volume of water is reduced, so that the fire is capable of raising its temperature 1° during the time the engine makes half a stroke. Two cubic feet of steam are required to supply one stroke of this new engine, and the steam being cut off at half stroke, is expanded down to the same pressure as in the first engine. Two cubic feet of steam, at 30 lbs. pressure, is the production of 4 cubic inches of water nearly. The boiler is capable of evaporating 2 cubic inches of water during one stroke of the engine, when boiling under a constant pressure, as already shown; but we require the conversion into steam of 4 cubic inches of water for this engine.

The engine being started required, during the first half stroke, 2 cubic feet of steam. This reduced the pressure $\frac{1}{15}$th, or 2 lbs., and during this time the water evaporates 1 cubic inch, which would raise the pressure half a pound; and likewise the temperature of the steam is so reduced that the water gives out the excess of caloric, which being at least 2°, converts 2 cubic inches of water into steam, raising the pressure 1 lb. We have now 3 cubic inches of water converted into steam, this bringing up the pressure to 29·5 lbs. The water threw out 2° of heat, and received only 1° from the fire, so that the temperature at the half stroke is less than at starting. The temperature of steam at 30 lbs. pressure is 251·6°, which, on losing 1°, becomes 250·6°, and this last is the temperature corresponding to 29·5 lbs. pressure. The engine has now accomplished the first half of the stroke, and the steam supply from the boiler is cut off, the last half of the stroke being performed as in the first engine, double the power, however, being developed as the piston area is doubled in the new engine. During this last half of the stroke the water in the boiler *continues to boil*, and evaporates 1 cubic inch of water, and at the same time the water increases in temperature 1°. At the end of the stroke, then, the pressure is again 30 lbs.; the water is also at the corresponding temperature. Thus the boiler is now able to supply another stroke of the engine in the same manner as before, and the engine being double the size of that chosen for the first example, has exerted double the power with the same consumption of fuel in the same time.

The following illustration which occurred to me during my experiments will perhaps seem to explain how a gain is got by using steam in the manner pointed out. Let us take an iron bar of a certain length and

apply heat to make it expand, say an inch; in expanding thus it will develop what we may call 1 inch of power. If this bar is now cooled by water, it will contract 1 inch, another inch of power being thereby derived from it, making 2 inches in all. The heat is now absorbed by the water, and lost as far as regards this mode of using it. If, however, instead of cooling the bar by water we lay upon it a cold bar of equal size, the latter will take a certain quantity of heat from the first, and will expand, say half an inch, the first contracting half an inch. This, with the original expansion of the first bar, makes 2 inches; but in the second case we can still cool these two bars with water, making each contract half an inch, and thereby develop a third inch of power, or 50 per cent. more than in the first case.

The analogy this illustration bears to the action of the steam and water will be evident on considering that the water in the boiler corresponds to the first bar, and the steam in the boiler the second bar. The water rises in temperature during ebullition, which ebullition results in the development of power, and on the pressure being relieved the heat taken up by the water is given out, making more steam or developing more power.

In using steam in this manner, the steam and water spaces should bear a certain proportion to each other depending on the construction of the engine, and by proportioning them so that the water should *boil all the time* independently of the intermittent action of taking and giving, a low pressure engine may be made to surpass any of our present factory engines.

I have read of the trial of a government steamer having four cylinders of equal diameters and capacity, and as the case is to the point, I give it; two cylinders were tried cutting off at half stroke; afterwards the four cylinders were tried cutting off at one-fourth stroke (thereby using the same steam), and it was found that the first trial gave a better result than the last; whereas, they expected 50 per cent. of a gain in the last case, and were of course greatly disappointed, considering that extra radiation and condensation in the four cylinders was the cause. I cannot fancy such an engine to lose in that way by adding two cylinders; but had they divided the boiler into two, and connected two cylinders with each division, they would, no doubt, have had the gain they expected.

The much neglected boiler now claims a share of the attention hitherto bestowed on the valves and cylinders. Engineers have been far astray in imagining that the gain on working expansively arises wholly within the cylinder. The double cylinder engine affords a proof of this. The system of connecting a number of engines with boilers in communication with each other, all the engines running at different speeds with different lengths of strokes, and then seeking to gain by working one of the engines expansively is also another proof; for one chance of gain there are twenty of loss.

I do not prefer the proportions of cut off I have mentioned in my illustrations, but have merely taken these for the sake of simplicity. The higher the pressure with a proportionate cut off, the greater should be the volume of water in the boiler as compared with the steam space; a greater quantity of water will also be converted into steam by the same fuel, as the water (unlike the bar of iron) can be robbed of its heat almost instantaneously. We can therefore make use of it practically and gain by its properties. If the engine cuts off at one-sixth of the stroke, the volume of water in the boiler has five-sixths of the time of one single stroke to rise in temperature, and can be robbed of that heat in the first one-sixth of the stroke, independently of the quantity of steam raised by ebullition alone. We can now see the reason why the higher pressure with the corresponding cut off has performed the greatest duty in the Cornish engine. Those engines still admit of improvement, and I think the double-acting engines will now soon compete with them.

I have formed an idea as to the cause of boiler explosions, and will submit to you the result of my experiments if successful.

I am, Sir, yours, &c.,

ALEXANDER MORTON.

Glasgow, June, 1856.

CONDENSING STEAM ENGINES.

To the Editor of the Mechanics' Magazine.

SIR,—Having observed for some years, that the increase of pressure in the condenser of a steam engine does not decrease its economy in the same ratio that obtains between pressure in condenser and pressure on piston, I arrived at the conclusion that it was possible to find the maximum pressure in condenser that would give the maximum of economy where the mean effective pressure on piston was given, the feed water being forced into the boiler at the temperature due to pressure in condenser.

The two following statements are true when taken independent of each other.

1st. The nearer we approach to a pure vacuum in the condenser, the less will be the fuel used to drive the engine.

2nd. The hotter the feed water enters

the boiler, the less will be the fuel required to convert that water into steam.

In the first the amount of fuel used decreases with the decrease of pressure in the condenser. In the second, the amount of fuel used decreases with the increase of temperature of the water in the condenser, when the said water is used to feed the boiler. Hence there is a temperature and pressure in the condenser at which the greatest economical effect is produced.

In order to ascertain this, let

T = total heat of steam in boiler;

t = temperature of steam and water in condenser;

P = mean pressure of steam acting upon the piston in pounds per square inch;

p = pressure of steam in the condenser in pounds per square inch.

Then the ratio of effect will be for pressure $\frac{p}{P}$, and that for temperature $\frac{t}{T}$; the maximum of economy will be obtained when

$$\frac{p}{P} = \frac{t}{T} \quad \ldots\ldots(1).$$

But t and p are unknown whilst P and T are known, and in order to find t and p another equation containing them must be produced; this is furnished by Southern's Formula for pressures less than the atmosphere; namely

$$p = \cdot04948 + \left(\frac{51\cdot3+t}{155\cdot7256}\right)^{5\cdot13} \quad \ldots\ldots(2)$$

also $$p = \frac{t\,P}{T} \quad \ldots\ldots(3)$$

by transposing equation (1). Therefore

$$\frac{t\,P}{T} = \cdot04948 + \left(\frac{51\cdot3+t}{155\cdot7256}\right)^{5\cdot13}.$$

and since the temperature in the condenser will not be much affected by the quantity ·04948, it may be neglected; then by transposition we get

$$\frac{P}{T} = \left(\frac{51\cdot3+t}{155\cdot7256}\right)^{5\cdot13} \div t.$$

Giving this last equation a logarithmic form, we have

$$\log. P - \log. T = 5\cdot13\{\log.(51.3+t) - \log. 155\cdot7256\} - \log. t.$$

From which the value of t may be found for any value of P, by any of the methods of approximation. Double position is perhaps the simplest plan, and is the one I have adopted in order to get the values shown in the following tables.

By assuming any value for P, that of T is found by the formula given by Regnault, viz.

$$(t'-32^{\circ})\cdot305+1123\cdot7 = T$$

where t' is the temperature (Fahr.) corresponding to the pressure P′ of the steam in the boiler including the atmosphere. When t is found, p may be found by equation (3).

The following table shows the temperature and pressure in the condenser when P varies from 30 lbs. to 6 lbs. upon the square inch.

If the pressure in the boiler be increased to 70 lbs. or decreased to 20 lbs. the values of t and p will not be much changed, since T varies very little from the value in the table for these pressures.

Pressure in boiler = 40 lbs. above the atmosphere; ∴ T = 1202° Fahr.			Most economical pressure in condenser by indicator.
lbs.	Temperature Fahr.	lbs.	
P	t	p	$15-p$
30	150·5	3·72	11·28
28	146·5	3·36	11·63
26	141·9	3·02	11·98
25	140·6	2·92	12·1
24	138·6	2·73	12·27
22	134·8	2·48	12·52
20	129·6	2·14	12·86
18	125·6	1·9	13·1
16	119·3	1·64	13·36
14	113·	1·38	13·62
12	105·	1·09	13·96
10	98·7	·89	14·11
8	92·5	·73	14·27
6	84·	·57	14·43

This table shows that as the mean pressure on the piston increases, the pressure in the condenser increases also, when the economical effect is a maximum; and if we increase the mean pressure still further, we soon find that condensers with pressures equal to, and above the atmosphere, may be used with advantage as shown by the next tables.

Pressure in boiler = 55 lbs. including the atmosphere; ∴ T = 1202° Fahr.			Pressure in boiler = 85 lbs. including the atmosphere; ∴ T = 1211° Fahr.		
P	t	p	P	t	p
40	166	5·52	60	180	9·36
50	179	7·44	70	199	11·5
			80	208	13·74
			84·5	212	14·8

The above table shows that it is not essential that an air pump and condenser of the present construction are required in order to obtain the most economical result.

If condensation near the atmospheric pressure be adopted the temperature of the feed water may be 212° Fahr., which will dispense with the air pump altogether, at the same time saving a great amount of unnecessary power, and consequently a great amount of fuel.

And since the steam used will be of a higher pressure, the diameter of the cylinder may be much reduced, and considerable economy will be the result.

Steam of 37 lbs., including atmosphere, is six per cent. cheaper than steam of atmospheric pressure.

Steam of	42	lbs. is	7	per cent. cheaper.
,,	48	,,	8	,,
,,	55	,,	9	,,
,,	63	,,	10	,,
,,	70	,,	11	,,
,,	79	,,	12	,,
,,	87	,,	13	,,
,,	100	,,	14	,,
,,	110	,,	15	,,
,,	120	,,	16	,,

By dispensing with the air pump and using high steam, independent of expansion, a saving of about fifteen per cent. may be expected.

Where new steam engines are to be erected, a very great saving in the first cost will be obtained, and a great amount of space saved.

I am, Sir, yours, &c.,
THOMAS BALDWIN, *Engineer.*
Corn Market-buildings, Bury,
Lancashire, July 3rd, 1856.

WATER-CLOCKS.

To the Editor of the Mechanics' Magazine.

SIR,—Permit me, through the medium of your valuable Magazine, to notice what I consider a great improvement in the construction of water-clocks.

Horology, we all know, is a great feature of our present mechanical skill. In short, the common clepsydræ have two great defects; one, that the water runs out with greater or less facility as the air is more or less dense, and the other that the water runs more readily at the beginning than towards the end, as we all know that the pressure of water increases with its height. Now, the present plan is to work these machines on the principle of evaporation. For this purpose a porous earthenware long tube is obtained, into which water is placed; the machinery for the clock is then arranged in the usual manner.

The advantages of this mode will clearly be—1. The regularity of the decrease of the water. 2. The density of the air would very immaterially affect it, as the exit of the water takes place over the whole surface. These two advantages, I think, present great improvements, which, at any rate, would be worth the trying of persons connected with this branch of science. I need not say that the size and weight of the plunger or float, the diameter of the different wheels, the length and diameter of the hand and clock face, must be calculated in the usual manner.

The clepsydra should also be mounted on a stand, but should not be covered, as that would, by diminishing the play of air round the instrument, produce a slower motion, thereby deranging the working of the instrument. I am, Sir, yours, &c.,
J. A. D.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

WILSON, F. A. *Improvements in engines, machinery, and apparatus for exhausting, forcing, lifting, and for propelling on land and water.* Dated Nov. 13, 1855. (No. 2551.)

This invention relates to obtaining a propelling power by means of water, air, and a vacuum, and consists of various apparatus for raising and containing water, air, or steam; also for producing a vacuum in parts of the apparatus, or its attachments alternately charged. It also comprises certain machinery for utilizing the power thus obtained for the general purposes of propulsion on land, and for propelling through or upon water.

HOMAN, J. *Improvements in machinery for cutting up woven and other fabrics.* Dated Nov. 13, 1855. (No. 2552.)

The patentee uses a circular knife, which rotates in bearings carried by a slotted table, on which a pile of material to be cut is placed, the uppermost layer being suitably marked to guide the operator. A portion of the table is rendered capable of rising when required, to enable the knife to make a vertical cut straight through the pile.

WILKINSON, J., the elder, and J. WILKINSON the younger. *Improvements in communicating a shape or configuration to felted cloths and other manufactured fabrics.* Dated Nov. 13, 1855. (No. 2553.)

The patentees strain a length of cloth, while saturated with moisture, over a shape of equal length, and presenting several repeats of the counterpart of the figure which it is desired to impart to the cloth. The drying being effected while the cloth is in a state of tension, it takes a permanent set, and may be cut up as desired.

WEBB, W., J. WEBB, junior, and J.

CATSTREE. *Improvements in attaching door-knobs to spindles.* Dated Nov. 13, 1855. (No. 2554.)

This invention consists in a mode of securing the knob or handle to the spindle, by means of a spring catch.

MURDOCH, R. *Improvements in agricultural apparatus for sowing seeds and depositing manure.* Dated Nov. 13, 1855. (No. 2557.)

The main feature of these improvements is the use of glass chambers or vessels for containing the seed to be sown, or the manure to be deposited, so that the operator can watch the action of the apparatus.

FOSTER, W. *Improvements in machinery or apparatus for drying wool and other fibrous materials.* Dated Nov. 13, 1855. (No. 2558.)

This invention consists principally in the application to the above purposes of the machinery of the inventor for which provisional protection was granted on the 8th of March, 1855, with suitable modifications.

LAXTON, H. *Improvements in fire-arms.* (A communication.) Dated Nov. 14, 1855. (No. 2560.)

This invention relates to breech-loading fire-arms, and consists in furnishing the radial or hinged breech with a pin, which is allowed to have longitudinal movement against a spring in the breech, but is prevented from moving therein. The spring has a conical bend embraced by metallic expanding rings, which head enters and fits the interior of the barrel, the cartridge bearing against the end of the pin, so that when the powder is exploded the pin is driven in the radial breech, the one end at the same time expanding the rings and pressing them out against the barrel.

BURROWS, J. *Improved apparatus for winding coals or other minerals from mines, which said apparatus is also applicable for other similar purposes, and for machinery required for forming or constructing such improved apparatus.* Dated Nov. 14, 1855. (No. 2561.)

This invention consists in the employment of a compensating drum, conically formed, and having upon its surface a spiral groove or channel for the passage of the winding rope or band, which helical drum will compensate for the extreme weight of the chain, rope, or band employed, equalizing the power employed for raising such length of rope or band and load throughout the process of winding.

SKINNER, T. *Improvements in producing figures or ornaments upon the surfaces of metals.* Dated Nov. 14, 1855. (No. 2562.)

The patentee claims the mode or modes of producing raised or countersunk figures or ornaments upon the surfaces of plates or pieces of metal by causing them to be pressed against the faces of dies, moulds, blocks, or forms, by the addition of an appropriate tool or tools rubbing and pressing against the reverse sides of such plates or pieces of metal.

BARNES, W. *An improvement in connecting and supporting the ends of the rails of railways.* Dated Nov. 14, 1855. (No. 2563.)

The end of each railway bar is formed with a slit, in order to receive a connecting piece, which enters horizontally into the slit formed in either of the two contiguous railway bars, and is slided partly therefrom into the slit at the end of the other bar, and retains the ends of the two bars, at the same level; and to prevent the ends from shifting laterally, the connecting piece is made with projecting flanches which come on either side of the two bars. The piece is fixed by keys.

ROBINSON, J. *Improvements in machinery for drying wheat and other grain.* Dated Nov. 14, 1855. (No. 2565.)

A circular pan is used, under which is a hollow chamber, to receive steam, water, or other heated fluid. The grain is placed in the pan, and is kept stirred by suitable apparatus.

MOTAY, C. M. T. DU. *Improvements in the treatment of fatty and oily matters.* Dated Nov. 14, 1855. (No. 2566.)

The matters to be treated are first saponified with lime or other base, and then distilled. The base remains in the still, and pyrogenous fats and oils distil over. The matters which distil over are then mixed with an alkali or alkaline earth, and re-distilled, when a liquid and acidless product is obtained.

GOODYEAR, C. *Improvements in shoes and boots when India-rubber is used.* Dated Nov. 14, 1855. (No. 2567.)

This invention relates to a former patent wherein means of ventilating were applied to heels and soles of boots and shoes, and consists in making uppers or parts of uppers, when India-rubber is used, with corrugations, perforated with numerous holes to admit air.

BOUSFIELD, G. T. *An improved safety coal-hole cover.* (A communication.) Dated Nov. 14, 1855. (No. 2568.)

This invention consists in attaching rods to the underneath surface of the cover, which rods are permitted to slide freely in suitable openings in the cylinder or top plate of the coal-hole, the object being to prevent persons falling down the hole.

NEWTON, A. V. *An improved manufacture of electrotype printing surfaces.* (A communication.) Dated Nov. 14, 1855. (No. 2571.)

This invention relates to a mode of form-

ing electrotype shells to be used for printing, and also the mould or frame for holding the same flatwise upon the bed of the mould, while the fused type-metal is being poured into the mould to back up the shell, the chief object being to prevent the warping of such shells.

NEWTON, A. V. *Improvements in the construction of locks.* (A communication.) Dated Nov. 14, 1855. (No. 2572.)

This invention consists of a method of impressing the form of the key upon inert tumblers, which are then removed from reach through the keyhole before they reach the fence, which permits them, if properly arranged, to be moved far enough to permit the bolt to be thrown, but which checks them if not perfectly arranged. Also in restoring the tumblers to their original relative position as they are brought back within reach of the key, so that they cannot indicate what key has been used, &c.

DUNCKER, F. *A new instrument for electric telegraphs, called "despatch distributor," which will permit despatches of various contents being communicated at the same time to one or more stations by means of one or two line wires only.* (A communication.) Dated Nov. 15, 1855. (No. 2575.)

This invention will be described hereafter—probably in our next number.

LEA, W. *An improvement or improvements in taps or cocks.* Dated Nov. 15, 1855. (No. 2578.)

See page 28 of this Number.

MORRISON, D. *An improvement in the manufacture of articles with internal screws, when cast iron, malleable cast iron, or cast brass is employed.* Dated Nov. 15, 1855. (No. 2580.)

In this invention wrought-iron tubing is used, in which the internal screw is by preference first formed; but the screw may, if desired, be cut after the cast article has been made. The wrought-iron tube is placed in the mould, and the melted cast iron or malleable cast iron or brass is run into the mould, so as to become connected with the tube of wrought iron.

BOUSFIELD, G. T. *Improvements in breech-loading fire-arms.* (A communication.) Dated Nov. 15, 1855. (No. 2581.)

The improved fire-arm operates as follows:—A metallic cartridge is dropped into a breech-piece, which is returned to its firing position by an operating lever, and bolted by bringing up a centre handle. The joints between the barrel and the breech-piece, and between the latter and the moveable cone seat, are thus covered by the soft metal cartridge, which, at the instant of discharge, is forced into or against these joints, preventing the passage of smoke, and keeping the parts untarnished. *After the piece is discharged, the breech-piece is withdrawn,* and the moveable cone seat is caused to advance by a pin, and thus the empty cartridge-cases are slightly loosened from the chamber, and projected from the breech-piece, so that they may be withdrawn by hand.

CRUM, C., and C. PAUL. *Process for making bread.* Dated Nov. 16, 1855. (No. 2582.)

This invention consists in taking the dough after it has been mixed and kneaded in the usual way, and keeping it in fermentation until it has reached the acetous state, when the inventors add to it one-fifth of its weight of dry fresh flour, without additional water, and mix and break it rapidly and thoroughly through rollers, then cut and pierce it in a cutting machine, or by other means, and, after a slight fermentation in an uncovered state, expose it freely to the air. To raise it, they bake it in a quick ventilated oven.

COOKE, W. *An improved apparatus for cleaning knives and other cutlery.* Dated Nov. 16, 1855. (No. 2584.)

The patentee constructs an apparatus with a revolving cylinder, attached by centres and plummer blocks to an axle working in a cap or casing, into which is placed the cutlery to be cleaned. The machine is on a suitable frame work.

EASSIE, W. *Improvements in hammers.* Dated Nov. 16, 1855. (No. 2585.)

This invention relates to a "friction hammer." The principle carried out is, the obtaining by means of nipping action the elevation and release of a vertical rod or bar of iron, the lower extremity, which is shaped as a hammer head, performing the functions of a hammer.

YATES, J., and T. R. BIRCH. *An improvement or improvements in engines for raising beer and other liquids.* Dated Nov. 16, 1855. (No. 2587.)

This invention consists in transmitting the motion from the handles of beer-machines to the pumping mechanism by means of a wheel or disc working closely in the opening in the counter, case, or pillar in which the pumping mechanism is situated.

DENTON, J. *Improvements in looms.* Dated Nov. 17, 1855. (No. 2593.)

This invention consists of apparatus for working or making the shed without the use of the ordinary tappets. The patentee employs jacks above and below the healds, as usual, each jack being connected to each heald separately, and causes the ends of one of the series of jacks to be inclined either in straight or curved lines. The jacks are made to rise and fall by their ends coming in contact with pulleys, bowls, or projections on slides or risers placed in a frame which has a to-and-fro or vibrating motion, some of the said bowls or projections being

below, and some above the ends of the jacks, according to the pattern of the work. When the risers and frame are vibrating towards the jacks, if the pulleys or projections are below, they cause the ends with which they are in contact to rise and the heads to fall, but when above, the reverse operation takes place. The slides or risers are raised by means of springs acted upon by pegs on a drum.

SWINBURNE, R. W. *Improvements in furnaces used in the manufacture of glass.* Dated Nov. 17, 1855. (No. 2595.)

The inventor makes outlets or openings in the sides or ends of a furnace, or in both the sides and the ends, near to or a little above the level of the siege or floor of the furnace upon which the cuvetts or pots are placed, for the purpose of causing the heat or heated air proceeding from the fires to be drawn across the siege in such manner as to act upon the body, or upon the lower part of the cuvetts or pots, in a greater degree than in furnaces of the usual construction.

SHAW, J. *Improvements in the prevention of accidents arising from collisions on railways.* Dated Nov. 17, 1855. (No. 2596.)

These improvements consist—1. In employing the steam from the boiler of a locomotive engine in a separate cylinder for actuating the brakes. 2. In the use of metal rods and shafts, arranged along a line of railway, and actuated by cranks or levers affixed to such said rods, to enable an approaching train to give an alarm, by an incline on the engine or the tender, or both, operating upon the levers or cranks so as to sound a bell or whistle.

COLLIER, G., and J. W. CROSSLEY. *Improvements in means or apparatus employed in hot-pressing woven fabrics and other surfaces.* Dated Nov. 17, 1855. (No. 2597.)

These improvements relate to forming press plates of cast iron to receive steam, hot water, or hot air, for the purpose of heating them, and which may also, when desired, receive cold water, for the purpose of cooling them. Also, to supplying such hollow press plate with the heating medium, by means of pipes or tubes of vulcanized India-rubber, strengthened by cloth or other flexible material, so as to render them capable of resisting the pressure of the heating medium. Also, in employing intermediate of such hollow (or any other) press plates, and between the fabrics to be pressed, sheets of thin polished tin or other metal, in place of the press papers now used for that purpose.

COLLIER, G., and J. W. CROSSLEY. *Improvements in finishing fabrics and in treating yarns, part of which improvements is also applicable to producing ornamental effects upon other surfaces. Dated Nov. 17, 1855.* (No. 2598.)

This invention consists in producing a spangled or crystalline effect upon the surface of the matters treated, by the application thereto of scalygraphite or plumbago in a granulated state.

FLEETWOOD, J. *An improved portable apparatus for making malt, and for drying hops, corn, and other grains and seeds.* Dated Nov. 19, 1855. (No. 2600.)

This invention mainly consists of a cylinder composed of suitable perforated or reticulated material, and made single, or with a smaller cylinder in the interior thereof. For making malt, the cylinder is arranged so that it shall revolve upon its axis partially within a semi-cylindrical vessel placed underneath it containing water, called the cistern. The barley is put into the cylinder, which is then caused to revolve, so that every grain is submitted to the action of the water.

PRATT, J., and T. RADCLIFFE. *Improvements in the manufacture of brushes.* Dated Nov. 19, 1855. (No. 2601.)

The handle, which extends beyond the end of the brush, instead of being in a line with the same, is cranked or raised up so as to give a firm hold, and keep the knuckles clear from the article being brushed. The bristles are also made longer in the middle than at the ends.

SMITH, W. *Improvements in gas-regulators.* (A communication.) Dated Nov. 19, 1855. (No. 2602.)

This invention relates—1. To an improved construction of the body of the regulator having the valve-seat and valve-gear placed in the top or upper part of the apparatus, and comprised within the space of the regulating gas-holder disc. 2. To the employment of a luted cylindrical or barrel-shaped vessel or floated valve, for increasing or diminishing the aperture for the passage of the gas at the point of regulation, and so contrived and operated as to be entirely insensible to the action or pressure of the gas in the main. Also, to protecting the cylinders and the regulating gas-holding disc against the effect of the oxidation of the mercury, by coating that part of the vessel that dips into the lute with a vitreous or other similar glazing, or a thin coat of platinum or aluminium.

BROOMAN, R. A. *Improvements in apparatus for measuring liquids, which may also be employed as a motive power engine.* (A communication.) Dated Nov. 19, 1855. (No. 2604.)

This invention relates to improvements in apparatus for measuring liquids under the pressure of the column, applicable also as a motive power. The principle involved is distinguished by the fact that the measuring vessel—or, in case of motive power, the mechanism used to transmit the force of the

water—is worked in compressed air or some other elastic fluid.

LOPEZ, J. B. V. *An antibilious powder.* Dated Nov. 19, 1855. (No. 2606.)

This powder is prepared by mixing in a mortar about 1¼ lbs. troy of calcined magnesia with an equal weight of finely reduced white sugar, and passing the mixture through a sieve. A fourth part of it is then put in a jar, and 25 drops of essence of aniseed poured upon it, and the whole thoroughly incorporated. Another fourth part of the powder is then incorporated with the portion thus treated with aniseed, by rubbing the substances between the hands; the third and fourth portions are successively treated in a similar manner to the second portion, so as to obtain thorough incorporation of the whole.

NEWTON, A. V. *Improved apparatus for dressing flour.* (A communication.) Dated Nov. 20, 1855. (No. 2612.)

The improved apparatus which the inventor designates "a mechanical sifter or bolter" is composed principally of a sieve suspended in a box, and possessing therewith two movements, viz., a horizontal and a vertical reciprocating movement.

PULS, F. *A new electric light and heat.* Dated Nov. 20, 1855. (No. 2613.)

This invention consists in collecting and employing the hydrogen and oxygen gas or gases, generated from the decomposition of the water or exciting fluids in galvanic batteries or piles, so as to obtain an amount of light and heat therefrom sufficiently great to be rendered available for domestic and general purposes.

HARVEY, W. *An apparatus to be employed with reels, cylinders, or rollers, and for placing upon or taking off therefrom hanks, skeins, bands, and other articles without removing such reels, cylinders, or rollers from their bearings.* Dated Nov. 20, 1855. (No. 2614.)

An illustrated description of this invention was given in page 536 of our last volume (No. 1713).

FONTAINEMOREAU, P. A. L. DE. *Improvements in apparatus for preventing horses from running away.* (A communication.) Dated Nov. 20, 1855. (No. 2615.)

This invention consists in constructing a metallic eye-flap or blinker, with a hinge acted upon by a spring, adapted to any kind of bridle. A strap fixed to the moveable part, and passing through the rings placed in the front and headstall of the bridle, serves to regulate its action.

CLARK, C. F., and M. BOWER. *Improvements in bolts and fastenings, which they propose calling Clark and Co.'s Longitudinal Wedge Bolt.* Dated Nov. 20, 1855. (No. 2616.)

This invention consists *in so making fast*enings for securing doors, windows, and other such like purposes, that they shall require less accuracy in fitting than is necessary in the ordinary construction of bolts and fastenings, as also in avoiding the use of springs or catches.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

TEMPEST, R., J. TOMLINSON, R. HAMPSON, and J. HAMPSON. *Certain improvements in looms for weaving, which improvements are applicable to working the valves of steam engines.* Dated Nov. 13, 1855. (No. 2550.)

This invention consists in using oval or elliptical-shaped wheels, for the purpose of retarding, or causing to dwell at certain points, the cranks of looms for weaving.

MAWSON, J. *Improvements in cameras for taking photographic pictures.* Dated Nov. 13, 1855. (No. 2555.)

A description of this invention was given on page 225, of our last volume. (No. 1700.)

ESKELL, F. A. *Improvements in plates for attaching artificial teeth.* Dated Nov. 13, 1855. (No. 2556.)

This invention consists in coating or covering such plates with enamel.

TOLHAUSON, A. *Certain improvements in producing ice.* (A communication). Dated Nov. 14, 1855. (No. 2559.)

This invention consists in introducing the water into the ice cellars by given quantities, and in causing a powerful current of air from without to pass over the surface to be frozen up, at the moment when the temperature gets down to the freezing point.

MOTAY, C. M. T., DU. *Improvements in the manufacture of lubricating materials.* Dated Nov. 14, 1855. (No. 2564.)

This invention consists in mixing pyrogenous oils (that is to say, oils obtained by destructive distillation) with animal or vegetable oleine to obtain a lubricating material.

JACQUES, F. *The use and method of preparation of a new material to be used in the process of dyeing silk.* Dated Nov. 14, 1855. (No. 2569.)

The "new material" is the "double chloride of zinc and barium."

COX, E. G. *Certain improvements in picking or cleaning cotton, wool, and other filamentous substances.* Dated Nov. 14, 1855. (No. 2570.)

The machine described is furnished with a table from which a workman throws forward in handfuls a supply of cotton on to a grating, which rises and falls; between the openings in the grating the teeth from a fixed comb enter, and by the motion and rising of the grating the cotton is subjected

to a combing action. The grating in rising places the cotton from prongs which project upwards upon a cylinder between two vertical blades, one brought from above and the other from below. The cylinder which draws forward the cotton is coated with felt or cloth, over which strips of leather are laid; the cylinder works in a horizontal position, and is cleared of the cotton by a roller which revolves in contact with the cylinder at the side opposite to that at which the cotton is fed on to it. From this roller the cotton falls into a receptacle.

MÖLER, J. *Producing a transparent photographic picture on ivory, without injuring the nature of the ivory, so as to be able to finish the picture with colours like other miniatures.* Dated Nov. 14, 1855. (No. 2573.)

This invention consists in producing a transparent positive photographic picture, and transferring the same upon ivory, by means of a gelatine or glass medium.

PITMAN, J. T. *Improvements in the construction of iron beams and girders, and in machinery for making the same.* (A communication.) Dated Nov. 15, 1855. (No. 2574.)

The improved beam or girder is formed of a single bar of sheet or wrought iron brought to the required form by a series of consecutive swaging operations performed by certain improved machinery. The side elevation of the beam is a parallelogram, and its cross section shows a pair of flanges at bottom from which rise the closed sides of the beam, surmounted by a tubular arch. The flanges rest at the ends of the beam upon the walls of the building, and form, throughout their length, abutments for the support of an arched fire-proof flooring and ceiling. The machine for making this beam or girder consists of a series of pairs of rolls, or revolving swages and dies, arranged to act consecutively and automatically upon the iron.

HINKS, J. L. *An improvement or improvements in brushes.* Dated Nov. 15, 1855. (Nov. 2576.)

Instead of placing the handle, as in the common hearth brush, at the middle of the head of the brush, and perpendicular, the inventor connects the handle with the head near the end of the latter, and places the handle so as to form an obtuse angle with the head.

LISTER, G. *A cooling apparatus to be used in brewing.* Dated Nov. 15, 1855. (No. 2577.)

Within a vessel containing cold water, the inventor arranges and disposes lengthwise a series of pipes, the ends whereof are left open, and are securely fixed into the ends of the vessel. The beer to be cooled, entering the open ends of the several pipes, passes along the same, and is discharged cooled at the opposite ends.

JOHNSON, J. H. *Improvements in carding engines for carding cotton and other fibrous materials.* (A communication.) Dated Nov. 15, 1855. (No. 2579.)

This invention consists of improvements upon a patent dated 25th Nov., 1853. The inventor has so modified the parts of the top card cleaning and elevating mechanism described in the specification of that patent, as to render the entire apparatus for raising, stripping, and depressing the top cards, and for moving the frame which carries the same from top to top, dependent for its motion upon a single pulley or wheel fixed upon the doffer shaft, and by altering the size of this pulley or wheel he is enabled to regulate at pleasure the number of tops to be stripped per minute, &c.

BABBITT, B. T. *Manufacturing soap.* Dated Nov. 16, 1855. (No. 2583.)

This invention consists in the manufacture of a portable chemical compound, composed of the carbonate of soda, and the oxide of calcium, to be used in the manufacture of soap. These substances are combined in a dry state.

HUDSON, T. *Improvements in machinery or apparatus for cutting and punching metals, paper, leather, and similar articles.* Dated Nov. 16, 1855. (No. 2586.)

This invention relates to shears, and consists of an arrangement of the parts so as to obtain additional power, and also means of passing the material through the shears in a perfectly horizontal position without the usual bend or curve produced by cutting.

HINKS, J., and F. DOWLER. *New or improved machinery for the manufacture of percussion caps, and for cutting out and raising articles in metal generally.* Dated Nov. 16, 1855. (No. 2588.)

The sheet metal is supplied to the improved machine by a feeder, and passes between dies, by the descent of the upper one of which blanks are cut out and delivered into a second feeder, by which they are carried to a second pair of dies, by the descent of the upper die of which the blank is raised into the proper shape. The last-named feeder on advancing to the cutting out dies, leaves the blanks in the raising dies. Before the return of the said feeder the raised articles are heaved from the lower die, by pegs passing through the bottom of the same, and as the said feeder brings other blanks over the raising dies, it pushes off the articles previously raised by means of a brush. The sheet of metal after passing from the cutting dies, rises in a nearly vertical direction out of the machine.

PEYTON, E., and D. MORRISON. *Improvements in manufacturing parts of metal bedsteads.* Dated Nov. 16, 1855. (No. 2589.)

This invention consists in employing cast-

ings of brass for the purpose of connecting the parts of brass bedsteads, and using heated cast-iron moulds, for casting the ornamental parts, parts of castors, and other parts of bedsteads, when of brass.

PETARD, L. A. *Certain improvements in manufacturing velvet and other similar fabrics.* Dated Nov. 16, 1855. (No. 2591.)

This invention consists in manufacturing pile and cut-pile fabrics, by working the threads in the loom so as to leave a space between a certain number of weft threads passed in the ordinary manner, some over or upon a ground warp, and others over or upon a second warp, which forms the pile or surface warp, and then, by means of the reed, bringing the pile threads to the ground threads to form a loop, which loop is repeated again and again at proper distances to produce the fabrics before-mentioned.

HOSKING, J. *Improvements in vertical direct-action marine engines.* Dated Nov. 17, 1855. (No. 2592.)

This invention consists in forming the air-pump condenser, and condenser bottom, in one piece, independently of the sole plate, so as to obviate the necessity for a steam joint in such situation; also, in order to render the engine simple and compact, and capable, when applied to screw propellers, of being placed further aft than when the condenser-bottom is formed in the bedplate.

BALL, H. *An improvement in gun-sights.* Dated Nov. 17, 1855. (No. 2594.)

This invention consists—1. In having a solid top elevation to the leaf or standard of the gun-sight. 2. In a reversal of the slide spring, thereby rendering the view more distinct, and the construction more simple.

CULPIN, T. *An improved apparatus for regulating the supply and discharge of fluids and gases.* Dated Nov. 19, 1855. (No. 2599.)

This apparatus consists—1. Of a pipe, having one end formed with an eccentric flange having in its inner side a recess, so that when attached to the flange of an ordinary pipe, or to any part of a steam boiler or other vessel, the recess shall form a chamber or valve box. The end of the pipe opening into the valve box is covered by a valve, moveable upon a hinge, formed by a spindle attached to the valve, and passing through a boss formed upon the pipe concentric with the flange. Upon the outer end of the spindle is fixed a lever for working the valve. Two-way and three-way cocks are formed by making openings in the valve box or flange. 2. Of a bored cylinder, fitted with two independent pistons, to one of which is attached a handle by a spindle passing through a stuffing-box, and to the other is attached the before-*mentioned* plate or valve covering the end of the pipe. By means of a small passage the pressure of the fluid or gas is brought to act upon the two pistons, causing the valve to close or open, as the case may be, independently of the will of the individual using it.

SILVESTER, J. *Improvements in steam-gauges and safety valves.* Dated Nov. 19, 1855. (No. 2603.)

These improvements consist in combining the steam-gauge with the safety valve in one instrument.

M'NICOL, J. *Improvements in machine or cylinder printing.* Dated Nov. 19, 1855. (No. 2605.)

The inventor proposes to make the doctor much stronger than hitherto, and to fix very strong brass bushes at each end, so that, when it comes in contact with the copper rollers and colours, he shall be enabled to print black grounds as well as white. He makes the doctor the whole width of the copper roller.

GILARDEAU, M. P. A. *A new motive power.* Dated Nov. 19, 1855. (No. 2607.)

This invention consists—1. In using a quantity of liquid equal to a weight of at least three atmospheres to compress the air alternately into two parallel pumps. 2. In making use of the compressed air for propelling a horizontal cylinder in which a vacuum is produced. 3. In compelling the weight employed for compressing the air to pass from one side of the apparatus to the other.

*** No. 2590 has not been granted.

PROVISIONAL PROTECTIONS.

Dated May 14, 1856.

1135. William Pollock, of Paisley, Renfrew, N.B., merchant. Improvements in the treatment or manufacture of ornamental fabrics of the lappet class.

Dated May 15, 1856.

1149. James Young Simpson, of Edinburgh, Mid-Lothian, doctor of medicine, and Wyville Thomson, of Belfast, Antrim, professor of geology. Improvements in the manufacture or production of lubricating oil from a new material.

1151. Robert Foulds, overlooker, and William Bracewell, manufacturers, both of Barnoldswick, near Colne, Lancaster. Certain improvements in power looms constructed on what is called the loose reed principle.

Dated June 2, 1856.

1297. Henry Cartwright, of the Dean Broseley, Salop. Improvements in the application of steam cocks to steam engines, and in working such engines thereby.

Dated June 3, 1856.

1323. François Auguste Verdeil, medical doctor, residing at Rue St. Sulpice, Paris, France. Improvements in obtaining a particular green colouring matter from artichokes and thistles.

Dated June 7, 1856.

1359. William Denny Ruck, of Topping's-wharf,

and Victor Touche, of Rathbone-place, Oxford-street, Middlesex. Improvements in the manufacture of paper from fibres not hitherto applied to such purpose.

Dated June 10, 1856.

1377. Carlo Pietroni, of London-wall, London, merchant. Improvements in printing on cloth and other fabrics. A communication from G. Bossi, of Vienna.

Dated June 19, 1856.

1442. William Hunt, of Tonge, near Middleton, Lancaster, silk manufacturer. Certain improvements in machinery or apparatus for polishing and finishing yarns or threads.

1444. Guilford Lindsay Molesworth, of Beaufort-buildings, Strand, London, Middlesex, engineer. An improved pendant child's cot.

1446. George Pye, of Ipswich, Suffolk, flax manufacturer. An improvement in preparing silk.

1448. William Parsons, of Pratt-street, Old Lambeth, manufacturing engineer. Improvements in washing and bleaching woven fabrics.

Dated June 20, 1856.

1451. Edward Henry Cradock Monckton, of Chancery-lane, Middlesex. Improvements in pianofortes.

1452. John Talbot Pitman, Gracechurch-street, London. A new method of using the electric current or currents for telegraphic and other purposes. A communication.

1453. James Bullough, of Accrington, Lancaster, manufacturer. Improvements in looms.

1455. Jonathan Hague, of Ashton-under-Lyne, Lancaster, overlooker. Improvements in machinery or apparatus for manufacturing bands or cords for driving machinery and other purposes.

1456. Michael Thomas Crofton, of Leeds, York. An apparatus for inking stamps used by bankers and others.

1457. Henry Pigott, of Glasgow, Lanark, N.B., hat manufacturer. Improvements in hats and other coverings for the head.

1458. Stopford Thomas Jones, of Royal-circus-street, Greenwich, Kent, and Josiah Harris, of Dolgelly, in Merionethshire, North Wales. An amalgamating machine to extract gold and silver, and to separate iron from crushed mineral ores in water.

Dated June 21, 1856.

1459. Joseph Bennett Howell, of Sheffield, York. Improvements in the manufacture of cast steel tyres.

1460. Emile Ventré, of Paris, France. An improved carton or box for keeping papers or other articles.

1461. George Davies, of Serle-street, Lincoln's-inn, Middlesex, civil engineer. Improvements in apparatus for measuring and indicating the leakage of vessels. A communication from R. Shaler, of Madison, America.

1462. Elias Robison Hancock, of North Frederick-street, Dublin, esquire. Certain improvements in mechanism connected with engines to be worked by steam or other motive power.

1463. William Armand Gilbee, of South-street, Finsbury, London, gentleman. Improvements in locomotion on railroads, part of which improvements are also applicable to ordinary roads. A communication.

1464. Charles Minne and Amand Colson, of Brussels, civil engineers. Improvements in making bread.

Dated June 23, 1856.

1465. William Valentine Miller, of Portsmouth, Southampton, Paymaster in Her Majesty's Navy. Improvements in propelling vessels.

1466. Jean Charles Lefevere Lacroix, merchant, *of Heutrégiville (Marne), France.* Filthing and shaving the merino, plain satin, and muslin of wool.

1467. James Johnson and William Blackwell, both of Ashton-under-Lyne, Lancaster, overlookers. Certain improvements in self-acting mules for spinning.

1468. Goldsworthy Gurney, of Bude, Cornwall. Certain improvements for warming and moistening air.

1469. Robert Roger, of Stockton, Durham, engineer and ironfounder. Improvements in machinery employed for the cultivation of land.

1470. James Atkinson Longridge, of Fludyer-street, Westminster, Middlesex. Improvements in obtaining and applying motive power for the conveyance of minerals, pumping, and other purposes in mines in which motive power is required.

1471. George Riley, of The Grove, Lambeth, Surrey. An improved refrigerator for cooling brewers' and distillers' worts.

1472. John Miller, of Drogheda, Ireland. Improvements in furnaces for more effectually consuming the smoke, and economizing the fuel employed therein.

1473. Henry Hussey Vivian, Bernhardt Gustav Herrmann, and William Morgan, all of the Hafod Works, Swansea, Glamorgan. Improvements in the manufacture of copper, and in obtaining gold and silver from the ores employed in such manufacture.

1474. George Dyson, of Tudhoe Iron Works, Durham. Improvements in the manufacture of iron.

1475. Isaac Atkin and Marmaduke Miller, of Nottingham, gentlemen. Improvements in machinery for sewing lace and other fabrics.

1476. Charles Mills, of High-street, Camden Town, Middlesex. An improvement in the hammer rails of pianofortes.

Dated June 24, 1856.

1477. Edwin Hardon, of Stockport, Chester, manufacturer, and Joseph Henry, of the same place, mechanic. Improvements in looms for weaving, and in machinery for communicating motion to looms and other machines.

1478. John Taylor, of Hackney-road, Middlesex. An improved vessel for containing chemicals for the generation of disinfecting gases.

1479. John Saxby, of Brighton, Sussex. A mode of working simultaneously the points and signals of railways at junctions to prevent accidents.

1480. David Davies, of Wigmore-street, Cavendish-square, Middlesex, coach maker. Improvements in wheel tyres.

1481. Joseph Harrison, of Blackburn, machinist, and Christopher Gelderd, of Lowmoor, Clitheroe, manager, Lancaster. Improvements in machines for warping and sizeing or otherwise preparing yarns or threads for weaving.

1483. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in railway breaks. A communication from J. B. M. A. Cochot, of Paris, France.

1484. Leonard Bower, of Birmingham, Warwick, manufacturer. An improvement or improvements in the manufacture of bolts, rivets, spikes, screw blanks, nuts for screws, and washers.

1485. Samuel Sinclair Robson, of West-street, Gateshead, Durham, agent. Improvements in railway and other carriage breaks.

1486. Abraham Pope, of Edgware road, Middlesex, engineer. Improvements in the manufacture of steel.

1487. Jules Etienne Lafond, of Belleville, Paris, France, engineer. Improvements in lighting.

1488. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improved construction of life-boat. A communication.

Dated June 25, 1856.

1489. Charles Durand Gardissal, of Bedford-street, Strand, London. Improvements in engraving glass and crystals. A communication.

1491. Michael Allen, of Cavendish-grove, Wandsworth-road, Surrey, engineer. An improvement in arranging and working the slide valves of steam engines.

1493. George Armstrong Bates, of Wigan, Lancaster, mineral surveyor. Improvements in apparatus for the prevention of accidents in ascending and descending shafts of mines.

1495. Robert Wilson Chandler, of Bow, Middlesex, engineer, and Thomas Oliver, of Hatfield, Hertford, farmer. Improvements in engines employed for agricultural purposes.

1497. Jules Henri Etienne Mareschal, engineer, of Paris, France. Improvements in hydraulic presses.

1499. James Kenyon, of Bury, Lancaster, and Richard Kenyon, of the same place, manufacturers. An improved fabric to be used in printing and other similar purposes, and a method of joining or connecting the ends of the same.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

Alfred Ford, of Wellington-square, King's-road, Chelsea. Preparing and dissolving in naphtha or oil of turpentine, vulcanized India-rubber for the purpose of waterproofing, and for all or any of the other purposes for which the same not so prepared and dissolved is now applicable, and especially for the coating of iron ships' bottoms. June 27th, 1856.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," July 8th, 1856.*)

504. A. Inglis. An improvement in the manufacture of flexible bottles or cases for containing colours and other fluids and semifluids.

506. F. P. Walker. Improvements in machinery for cutting hay, straw, and other vegetable substances.

509. I. Westhorp. Improvements in concentrating milk, and in obtaining concentrated extracts from tea, coffee, and chocolate.

520. J. Graham. Improved machinery for cleaning and dressing rice, and other grain.

522. F. Connor. Improvements in looms for weaving.

523. C. Barlow. Improvements in machinery for cutting cloth and other textile fabrics.

539. A. Oppenheimer. Certain improvements in machinery or apparatus for stretching or distending velvets and other piled goods or fabrics for the purpose of cutting the pile of such goods.

544. J. Venables. Improvements in ornamenting articles made of clay, and other similar plastic materials.

550. C. T. Rosenberg. Improvements in ornamenting china, glass, and other surfaces, when transferring printed impressions.

554. S. Clegg and J. Kay. Improvements in machinery or apparatus for warping yarns.

555. R. D. Kay. Improvements in the manufacture of fabrics from fibrous materials.

574. T. Cook. Improvements in portable bedsteads.

575. H. B. Young. Certain improvements in steam engines.

576. H. Cooke. Improved machinery or apparatus for dyeing and dressing yarns or threads.

579. R. Hannah. Improvements in pottery kilns.

586. J. Davy and J. Milnes. Improvements in looms for weaving plaids, *plain weaving, and flounces or other ground work.*

616. C. D. Gardissal. An improvement in capstans.

617. C. D. Gardissal. An improvement in ships' windlasses.

682. G. G. A. L. M. Schelhorn. A new or improved pen holder.

725. J. Rock. Improvements in carriages, parts of which are applicable to other structures.

759. W. Muschamp. An improvement in the manufacture of paper in order to render the same waterproof.

764. C. D. Gardissal. Certain improvements in steam boilers.

796. G. B. Galloway. Improvements in propelling vessels.

898. T. Jeffries. Improvements in cooking-stoves.

1048. H. A. Thompson. Improvements in haymaking machines.

1101. G. Simpson. Improvements in rotary knife-cleaning machines.

1135. W. Pollock. Improvements in the treatment or manufacture of ornamental fabrics of the lappet class.

1297. H. Cartwright. Improvements in the application of steam cocks to steam engines, and in working such engines thereby.

1306. J. E. M'Connell. Improvements in locomotive engines.

1313. T. W. Willett. Improvements in the manufacture of gunpowder.

1321. R. Fletcher and E. Fletcher. Improvements in sweeping chimneys or other flues.

1421. W. Turner, G. Hulme, and H. Blackburn. Improvements in condensing and other carding engines, billies, and mules for carding, slubbing, and spinning woollen, cotton, or other fibrous substances.

1427. A. G. Baylis. An improvement or improvements in needles.

1436. W. H. Tucker. Improvements in locks and latches.

1441. G. Tillett. Improvements in bedsteads.

1483. J. H. Johnson. Improvements in railway breaks.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEARS' STAMP DUTY HAS BEEN PAID.

1603. Alfred Vincent Newton.
1611. William Woods Cook.
1613. Thomas William Kennard.
1615. Robert Anderson Rüst.
1631. Stephen Martin Saxby.
1636. Ewald Riepe.
1637. Ewald Riepe.

LIST OF SEALED PATENTS.

Sealed July 4, 1856.

1856.
48. Joseph Corbett.
52. Charles Jarvis and Thomas Deykin Clare.
66. George John Christian Erhard Hald.
69. William Barrie.
70. Edward Hallen and William Holland Kingston.
71. John Ashworth.
77. Martin Billing and Frederick Augustus Harwood.

110. Thomas Hill Bakewell.
130. Joseph Jesse Comstock.
162. Pierre Lewis Tieffé-Lacroix.
163. Jean Baptiste Pierre Alfred Thierry, junior, Jean Louis Richard, and Baron Henry de Martiny.
225. Jean Baptiste Jules Hyppolite d'Auvergne.
226. Pierre Samain.
261. Henry Tylor.
518. John Brierley.
899. Edmund Richard Southby.
934. Josiah George Jennings.
1045. Henry Edward Brown.

Sealed July 8th, 1856.

80. Jane Ann Herbert.
111. Thomas Dunn.
115. Vincent Scully and Bennett Johns Heywood.
125. Philip Rechten.
131. John Platt and John Whitaker.
173. Henry Elliott Hoole.
200. John Kershaw.
242. Henry Chance.
245. Abraham Pope.
247. Robert Walter Winfield.
253. Thomas Fewster Wilkinson.

NOTICES TO CORRESPONDENTS.

We have received several communications on "Mechanical Locomotion," but we cannot continue the discussion upon that subject in the new volume which has now commenced. We think it right, however, to state that in a letter from Mr. Rock, that gentleman shows that his views on the subject have by no means changed, as was alleged by "C."

P. D. C.—You had better go to the Library of the Government Patent Office, and examine the Specifications of Patents, which you can do any week day between 10 A.M. and 4 P.M.

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Skinner ..... Ornamenting Metals 40
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Newton ..... Printing Surfaces 40
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LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, *Dublin; W. C. Campbell and Co.*, Hamburg.

Mechanics' Magazine.

No. 1719.] SATURDAY, JULY 19, 1856. [PRICE 3D.

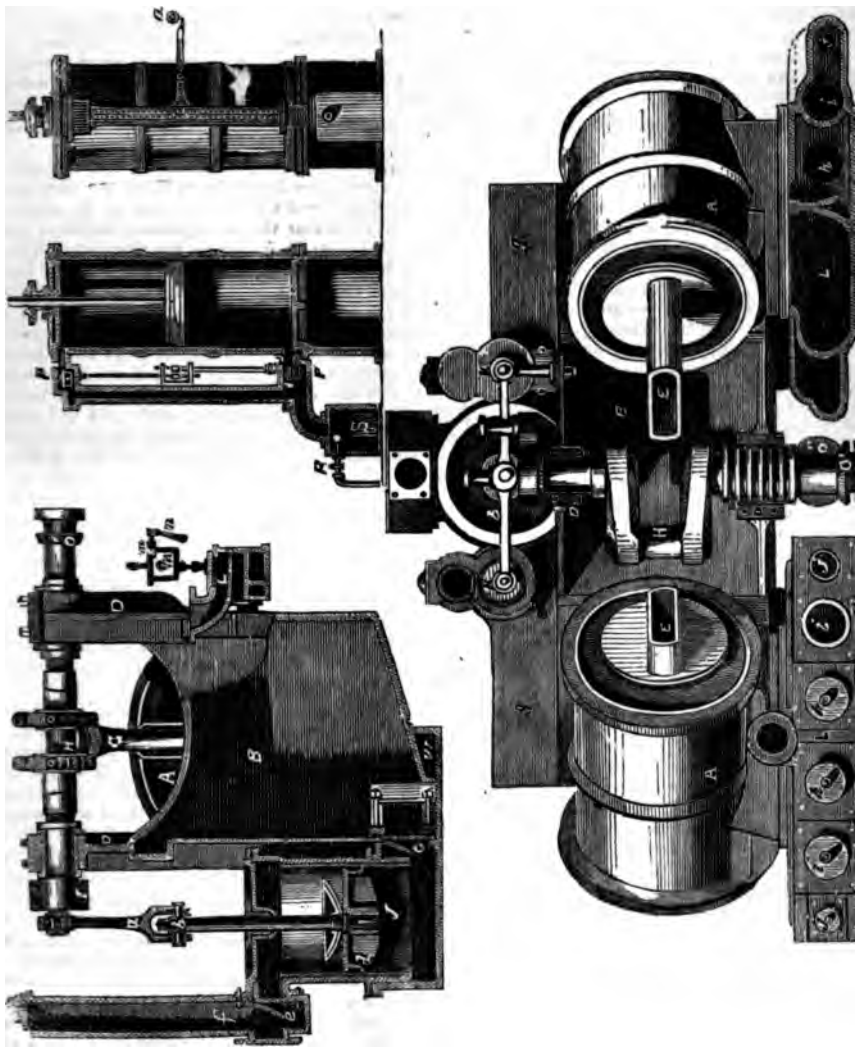
Edited by R. A. Brooman, 166, Fleet-street.

ROWAN'S IMPROVED CONDENSING STEAM ENGINES.

Fig. 4.

Fig. 5.

Fig. 1.



ROWAN'S IMPROVED STEAM ENGINES.

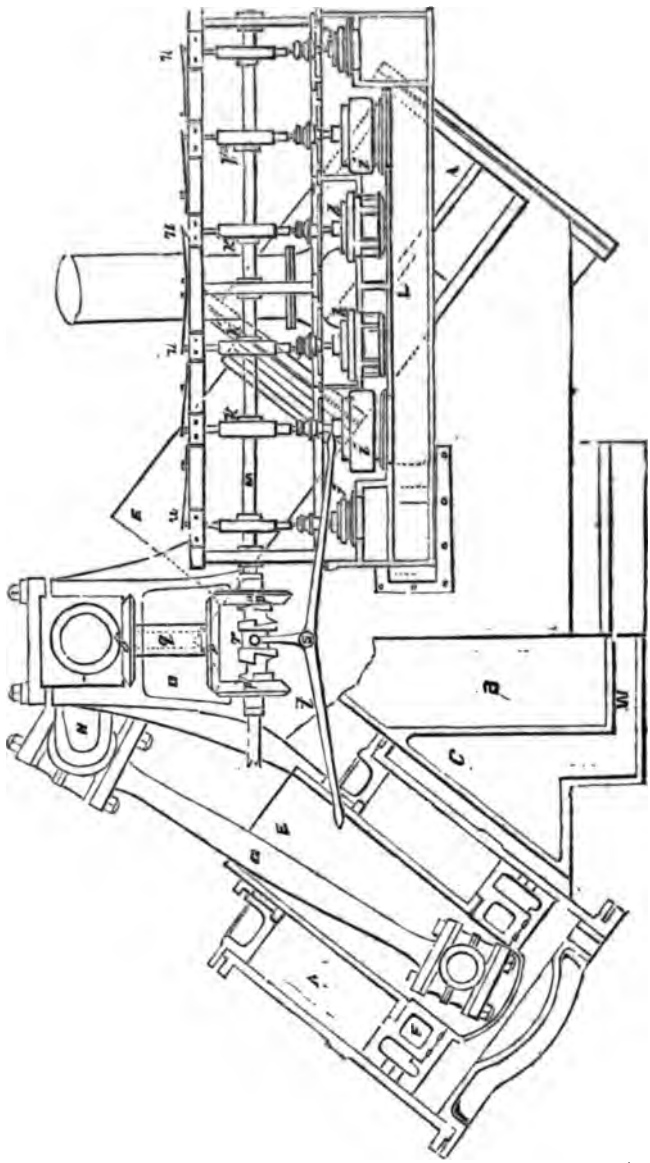
Mr. W. Rowan, of the firm of J. Rowan and Sons, of Belfast, has recently invented and patented certain very important improvements in steam engines. The invention consists of two parts: First, of an improved arrangement of the parts of steam-engines, whereby great compactness and strength are unquestionably obtained. The arrangement is intended principally for driving the screw propellers of steam vessels, and in it the cylinders of a pair of engines are placed at an angle of 45° with a vertical line, that is to say, at an angle of 90° with each other, and are bolted to the upper two faces of a triangular vessel of cast iron, which forms the condenser for the steam. Secondly, of a method of introducing a valve or valves, in addition to those now in use in condensing steam engines, and also an additional condenser with which the valves communicate. These valves are made to open for a short time immediately before the end of the piston's stroke, and a small quantity of injection water is introduced into the additional condenser, just sufficient to condense the steam, without producing more than a very partial vacuum. A quantity of water at nearly the boiling point is thus obtained, which is used for feeding the boiler, whereby considerable economy of fuel is produced, and the main condenser has less work to do in condensing the remaining portion of the steam; or the water obtained may be used for any other purpose.

The importance of the improved condensing arrangement just described is so apparent, that we do not think it necessary to point out the collateral advantages which are associated with it (particularly in the case of marine engines), and which will occur to the mind of every practical engineer. We may, however, state that the arrangement has been well tested in a pair of factory engines, where it has been in operation for the last eighteen months with very marked results. During this time the engines have frequently been worked both with and without the hot feed water apparatus on alternate days. The cylinders of the engines are 32 inches diameter and 5 feet stroke, and as there is a deficiency of fresh water in their neighbourhood, the condensation has been always effected in the main condenser by means of salt water from the sea, the limited quantity of fresh water being reserved for feeding the boiler. When the heating apparatus is out of use, the mean temperature of the boiler feed is 50°; whereas, with that apparatus the temperature is raised from 50° up to 160°, and sometimes 170°. The average consumption with cold feed water is 7 tons of hard Ayr coals per day, and with the patent apparatus at work the consumption is 5½ tons per day; thus, by the use of the apparatus, a saving of 1½ tons per day, or about 21½ per cent., is effected. These engines are working up to 250 horse power by the indicator, and there is also a 20 horse power engine supplied by the same boilers to which the apparatus is not applied, beside which steam is also taken away from heating the spinning troughs of a mill, and for boiling yarn, &c. Hence the result is not so good as it would be if the whole of the steam were under the operation of the heating apparatus. We are, of course, quite aware, that by this system there is a small loss of power occasioned by letting the steam away before the termination of the stroke of the piston; but the indicator diagrams show, that although there is a slight falling off on the side of the steam, this is fully compensated by the improved vacuum occasioned by having less steam to condense in the main condenser. The average vacuum as shown by the indicator is improved *two-thirds* of a pound, whilst the falling off on the steam side is only half a pound.

Having thus pointed out in general terms the nature and merits of Mr. Rowan's improvements, we proceed to lay before our readers a more detailed description of them. Fig. 1 of the accompanying engravings is an end view, partly in section, of a pair of steam engines constructed according to the first of these improvements; fig. 2 is a side view of the same, partly in section; and fig. 3 is a ground plan, having likewise some portions in section, for the purpose of showing the internal details. A A are the cylinders, placed at an angle of 90°, or thereabouts, with each other; B is the condenser, which also serves for the framework of the engine; D D are pedestals or bearings cast on the condenser, for carrying the crank shaft. This condenser is formed with the two opposite sides inclined towards each other, and meeting at the top at a right angle, and upon these sides the cylinders are bolted by means of flanges cast longitudinally on the cylinders which lie upon the condenser, a recess or groove being cast on each of these sides of the condenser of a suitable form and size to receive the projecting flanges on the under side of the cylinders. E E are hollow piston rods or trunks, to which the pistons, F, are attached, and having a joint pin at the lower end, on which the connecting rod, G, works. The connecting rods of both engines work into one crank, H. At one end of the crank shaft is fixed a crank, I, for the purpose of working the air pump, J, and the boiler and bilge pumps, K K, by means of a connecting rod, *a*, and crosshead, *b*. These three pumps are placed vertically, and are bolted down to a flange, *g*, cast on the condenser for this purpose, and also for affording a secure founda-

tion for the whole engine. *c* is the foot valve; *d*, the air-pump bucket; *e*, the delivering valve; and *f*, the hot well. L L are the valve boxes containing the valves, *h h*, for the admission of steam to the upper and lower ends of the cylinder; and *i i* are the valves for the exit of the same to the condenser; these are of the well-known double-beat form or

Fig. 2.



Cornish" valves, and are worked by the arrangement known as Rowan's fluctuating ider, which was "registered" by Mr. Rowan, 29th September, 1848. M is a cam shaft, which are mounted cams, *k k' k'' k'''*. Two of these cams, namely, *k'* and *k''*, act on the ictuating sliders, *l*, lifting the square frames, *m m*, and the valves, *h h*, attached to them.

Each slider, *l*, is capable of being pushed further in or withdrawn from the frame through the medium of the lever, *n*, a slot being formed in the end of the slider to allow the valve and attachments to rise, without affecting the position of the slider in its frame, thus allowing the valve to fall later or earlier, as may be desired, and consequently shutting off the steam later or earlier, and so varying at pleasure the degree of expansion of the steam in the cylinder. The cams, *k k''*, also act on the exhaust valves, *i i*, but have no sliders, the part of the frame on which they act being fixed. *j j* are additional valves, the employment of which forms a portion of the second part of the invention; but they may or not be used in connection with this part. O' is a bevel wheel, fixed on the crank shaft, and giving motion to the bevel wheel, O'', on the short upright shaft, *q*. On the lower end of this upright shaft is fixed the bevel wheel, *p*, imparting motion to the two bevel wheels, *p'* and *p''*, in reverse directions; these wheels may be all of one size, or their sizes may be different, so that the wheels, *p'* and *p''*, may revolve in the same time as the crank shaft. The wheels *p'* and *p''* revolve loosely on the cam shaft between collars, and between them is a clutch *r*, capable of sliding on end on the cam shaft, but prevented from revolving independently of the shaft by a feather or key fixed on the latter. This clutch is acted upon by the lever *s*, attached to the two levers *t* and *t'*, by which means the clutch becomes fastened to either the wheel *p'* or *p''*, and the cam shaft is made to partake of the movement of either one of these wheels at pleasure. The clutch has but one tooth on each side, and the cams are so adjusted as regards these teeth, that while one tooth is set for giving the valves the right motion for the engine going forward, the other one will be right for the engine going backward. Thus, the engine is reversed by depressing either the one or the other of the levers *t* or *t'*. The cam shaft will always revolve in the same direction, inasmuch as its relative motion as regards the crank shaft is changed by the clutch and bevel wheels when the direction of the motion of the crank shaft is changed; but to prevent the cam shaft from getting a wrong motion in the act of reversing the engines, which wrong motion would cause the points of the cams to catch against the points of the sliders, and so injure the machinery, the teeth of the clutch are bevelled on the side opposite to that on which they drive the wheels, and consequently the clutch will be thrown out of gear in the event of such a wrong movement taking place. *u*, *u*, *u*, are springs, acting on the top of the frames of the valves, to assist in closing the valves when their own weight is not capable of closing them with sufficient rapidity; but except in the case of engines revolving very rapidly these springs are not requisite.

In figs. 1, 2, and 3, is also shown one method employed in carrying out the second part of the invention; *h*, *h*, and *i*, *i*, represent the usual steam and exhaust valves; and *j*, *j*, are the additional exhaust valves, one of which is in connection with each end of the cylinder: they are worked by cams on the same shaft as those which lift the ordinary valves. C is a chamber, cast in the main condenser, and serving as an additional condenser; there is also a similar condenser formed in the opposite corresponding side of the main condenser. These two additional condensers are connected by the passage *w* under the main condenser. The valves *j*, *j*, are in connection with these auxiliary condensers, and a jet of water from either the hot well *f*, or elsewhere, regulated by a valve or cock, is admitted into each of these condensers in just sufficient quantity to condense the steam issuing through the valves J, J, without producing more than a very partial vacuum. The hot water thus obtained is conveyed to the boiler by one of the pumps, K, K, and the quantity necessary to maintain the water in the boiler at its proper level is regulated by the valves or cocks which admit the jets into the auxiliary condensers. The valves, J, J, are opened for a short time only before the termination of the stroke, commencing some time after the corresponding steam valve has closed, and closing immediately before the corresponding main exhaust-valve begins to open. The length of time they remain open is determined by the quantity and temperature of the feed-water required; but it is found that from a fourth to a third part of the whole stroke is a very good proportion.

In applying this part of the invention to engines in which it is desired to retain the ordinary valves, the arrangement represented in figs. 4 and 5 is adopted. Fig. 4 is an elevation of a cylinder of an engine, the ordinary valves of which are not shown, as they are not in any way interfered with by the improvements. Fig. 5 is a section of the same, taken at right angles to fig. 4. N is the auxiliary condenser, into which the exhaust steam is admitted by the valves, P, P, which are alternately opened by the cams, Q (one only of which is shown), a short interval before the termination of the stroke, as before described. R is the injection cock; and S the orifice of the pipe through which the hot water forme by condensing the steam is conveyed to the feed pump, and thence to the boiler.

THE CHELMSFORD MEETING OF THE ROYAL AGRICULTURAL SOCIETY.

THE annual meeting and exhibition of the Royal Agricultural Society, held at Chelmsford during the present week, have been attended by much enthusiasm on the part of the inhabitants of that town and its neighbourhood, and by great interest among the numerous visitors who journeyed thither from all parts of the kingdom, as well as from abroad.

The Walk-field, which consists of more than twenty acres of meadow land, the property of Lady Mildmay, was used for the show-yard; and in order to facilitate the transport of cattle, machinery, &c., the Eastern Counties Railway Company laid down a short branch line leading up to the entrance of it. The exhibition of agricultural implements, machinery, corn, and seeds, occupied the greater part of the space, the cattle and poultry show covered about seven or eight acres, and on the remainder stands the pavilion in which the annual dinner was celebrated on Thursday, and which accommodated more than a thousand persons.

The machinery and implement exhibition (which is all with which we have to do), comprised the usual variety of apparatuses, but prizes have been awarded to certain classes of these only. This constitutes a new feature of the Society's exhibition, and one which is to be repeated in succeeding years. In our judgment the arrangement is a good one, and will, in all probability, be productive of greater results than the old practice could possibly have been, in consequence of the increased attention which will now be given in turn to every branch of agricultural operations. The classes of articles selected this year for prizes are those used for preparing land to receive crops, reaping machines, tile machines, and draining tools. The stewards of the implement department are Sir Archibald Macdonald and Mr. C. Wren Hoskyns; the engineering judge is Mr. J. V. Gooch, of the Eastern Counties Railway; the judges of ploughs, &c., are Mr. C. S. Read, of Brandon, Mr. H. B. Caldwell, of Hiberston, Brandon, Mr. Thomas Huskinson, of Efferstone, Southwell, Notts, and Mr. Hawkins, of Sudbury, Suffolk. The judges of harrows, cultivators, clod-crushers, &c., are Messrs. J. Jephson Rowley, of Rawthorne, Chesterfield, Derbyshire, and John Clarke, of Long Sutton, Lincolnshire. The judges of tile machines, draining tools, &c., are Messrs. J. H. Nalder, of Alverscote, Lechlade, Gloucestershire, and W. Chalcroft, of Branshott, near Lipbrook.

On Monday morning the light-land ploughs of Ball, *Busby, Fowler, Fry,* Howard, and Ransome, were tried, and gave general satisfaction.

On Monday afternoon a trial of reaping machines took place upon a piece of rye tolerably heavy, though but partially ripe. Burgess and Key's M'Cormick's reaper, fitted with their patent screw platform, produced excellent results, the Archimedian screws (described and illustrated at page 241 of our 62nd volume, No. 1649), delivering the corn in admirable order. Dray's Hussey's reaper, with tipping platform, also worked well. Among the other machines tried were Palmer's "Union" reaper, made by Messrs. Dray and Co., the platform of which is fitted with radiating rollers, as described and illustrated at page 433 of our last volume, No. 1709; Crosskill's Bell-M'Cormick reaper, as exhibited at Carlisle last year; and the same with a new delivering apparatus, composed of two endless straps, having wooden teeth or projections attached to them, these straps passing from side to side in front of an inclined platform.

On Monday there was also tried a water drop drill, invented by Mr. Chambers and manufactured by Garrett. By this drill the liquor is supplied with the seed, and not wasted, as in the ordinary liquid-manure drill, by being poured out continuously. The trial gave great satisfaction to the judges.

We must not omit to mention that in this year's exhibition machinery in motion was for the first time applied to implements which are designed to be so driven, in order that the display might be as complete and satisfactory as possible.

The most interesting feature of the Chelmsford meeting was supplied by the apparatus designed for ploughing land by steam. No intelligent person can have visited that meeting without acquiring, if he did not before possess, the conviction that the day when steam is to play an important part in our practical husbandry is near at hand. Notwithstanding many discouragements, and the inherent difficulties of the matter, our mechanists cannot shake off the conviction that the power which is at once both mighty and controllable is fully applicable to the breaking up of the land. They cannot persuade themselves that a motive power which is already most extensively applied to the lightest, as well as the heaviest operations of our multifarious manufactures, is not destined to speedily drive the share through the soil, not only when the latter lies as level as a pool, but even though it undulate like the waters of the sea. They cannot believe that the limited results hitherto attained are the bounds to our progress in this direction; and therefore, we believe, great results may be anticipated from the prominence given to the subject at Chelmsford.

The first of the steam ploughing machines exhibited at Chelmsford, which we shall notice, is Mr. Boydell's. This is an improvement upon his last year's engine, and consists of a common portable eight-horse boiler, with two 6½ inch cylinders, a fly-wheel on one side to drive any machinery by band in place of a stationary engine, and pinions on the other side gearing with a spur-wheel attached to one of the large wheels of the carriage upon which the engine is mounted. These wheels are fitted with the endless railway, which has already been described in our pages (vol. lxiii., p. 245, No. 1675), and with which the whole machine is enabled to cross the roughest land, to stalk up steep inclines, to move immense weights, and to overcome great resistances, in the most remarkable manner. It is steered by means of a tiller and steering-wheel, like those of a ship, and weighs in all (including water) nine tons. It will be observed that with this machine the whole of the work is done by itself. There is no need of horse power to drag it from place to place, as with some other arrangements, and for this reason it approximates to what we should be disposed to look for in a good agricultural apparatus. It may be remarked, that in ploughing hill sides the machine will go up light, and work downwards, by which means very considerable inclines will be operated upon with facility. "The inventor considers his engine sufficiently powerful to draw, say ten ploughs in light land, at 6 inches depth, with a speed of two miles per hour. It has dragged some implements of very heavy draught during the trials, and was not unable to pull forward Coleman's ploughing machine. In an attempt with the dynameter attached to Biddell's cultivator, the instrument broke at 40 cwt., the draught of the cultivator as used being much greater still."

The next steam ploughing machine is Fowler's. Mr. Fowler is already known to agriculturalists by his steam draining plough, which was to be seen at work during the Chelmsford meeting on the crown lands, Hainault Forest, where also an improved double-screw brick machine of his was at the same time at work. For his steam ploughing apparatus he received a gold medal at the recent Agricultural Exhibition at Paris. In this apparatus two capstans or barrels on upright or other axes are combined on the same base plate or frame, and they receive motion from a steam engine in such manner that, when one of the barrels is being driven to wind on the wire rope, the other barrel is allowed to run free and to unwind the wire rope. The wire rope is *attached at either end to* upright or other *barrels or capstans; and is* passed through two guide pulleys anchored or fixed to the land, opposite to, yet distant from each other, and also distant from the two barrels. A plough or ploughs are attached to the wire rope, at that part which is between the two guide pulleys, so that when the wire rope is being wound on to one of the barrels and off the other, the plough or ploughs or other implements will be moved in a direction from one guide pulley towards the other, to the distance desired, and then, when the action of the barrel is reversed, the plough or ploughs will be moved in the opposite direction, and by varying the positions of the two guide pulleys from time to time the whole surface of a field may be ploughed or otherwise. The anchors consist of low trucks or wagons laden with earth, and furnished with sharp discs for wheels; these discs cut down into the land in a direction at right angles, or nearly so, to that in which the ploughs move, so that while they can be readily traversed, as may be necessary, along the headlands, they at the same time present great lateral resistance to the tension of the rope. Eight ploughs are connected to the apparatus for common ploughing—four for one trip, and the other four for the return. For ploughing trenches from 10 to 14 inches in depth, an implement two furrows' width and two deep is used.

In noticing Fowler's apparatus, and its operations, the *Times* of Wednesday says, "The ploughing is one-way work, but lands or stetches can be readily ploughed by simply turning the implement end for end for each half-land, and by shifting the anchorages accordingly. The work of common ploughing was exceedingly well done, and the trenching implement was drawn with great steadiness in ground through which ten horses were required to pull it. The amount of ploughing on land where three horses are commonly yoked in a plough capable of being done by a ten-horse engine is about eight acres per day of ten hours; and the expense of working, including four men and a boy, fetching water and coal, shifting the engine and tackle to the field, wear and tear, and interest of first cost (which is *£495*, including the engine) is apparently not more than *5s.* or *5s. 6d.* per acre. Trenching costs about double this sum. Should further experiments and calculations prove this estimate to be correct, there can no longer be a doubt that 'an economical substitute' has at last been perfected for the long venerated horse-plough."

The other steam ploughing machine was that of Mr. Smith, of Little Woolstone, Fenny Stratford, Bucks, whose combined subsoil and trenching plough was described and illustrated at page 481 of our 63rd volume, No. 1685. He works his ploughs

with a common 7-horse portable engine and a stationary windlass. Two ¾-inch wire ropes lead from two drums on the windlass round four pulleys, anchored by means of large toothed anchors, two of which are fixed and two shifted as the ploughing proceeds.

We shall give a further notice of the Chelmsford Exhibition in a succeeding Number.

SIEMENS' REGENERATIVE STEAM ENGINE.

BY C. W. SIEMENS, ESQ., C.E.*

THE steam engine of Watt was composed of four organic parts, namely—1. The furnace, or chamber of combustion, with its flues and chimney. 2. The boiler, or steam generator. 3. The steam vessel, or cylinder, wherein the elastic force of the steam is imparted to the piston, or other first moving parts of the machinery. 4. The condenser, where the elastic force of the steam is destroyed by abstracting its latent heat by injection of cold water, or by exposure of cooled metallic surfaces. In the case of high-pressure engines, it would seem that the condenser was suppressed; but it might be said that this class of engines makes use of one great common condenser, namely, the atmosphere, the separate condenser possessing only the advantage of relieving the working piston of the opposing atmospheric pressure. The only essential improvement of the steam-engine that has been introduced since the time of Watt consists in working the steam expansively, whereby a considerable economy has been attained; but it is well known that Watt foresaw the advantages that would be realized in this direction.

The lofty superstructure proved the soundness of the foundation Watt had laid; and it would seem hopeless to change the same, unless it could be proved that the very principle regarding the nature of heat, whereon Watt had built, had given way to another more comprehensive principle. The engine of Watt was based upon the material theory of heat that prevailed at his time, and almost to the present day. According to this theory, steam was regarded as a chemical compound of water and the supposed imponderable fluid "heat," which possessed amongst others the property of occupying under atmospheric pressure nearly 1,700 times the bulk of the water contained in it. The Boulton and Watt condensing engine took the full advantage of this augmentation of volume, which effected a proportionate displacement of piston, and the condensation of the steam obviated all existing pressure to the piston.

In the course of the last few years our views of the nature of heat had however undergone a complete change; and, according to the new "dynamic theory," heat, as well as electricity, light, sound, and chemical action, are regarded as different manifestations of motion between the intimate particles of matter, and can be expressed in equivalent values of palpable motion and dynamic effect. In support of this theory, he (Mr. Siemens) could not do better than refer to the able discourses, recently delivered in the Royal Institution, by Mr. Grove and Professor Thomson.

Viewed from the position of the new theory, the heat given out in the condenser of a steam engine represented a loss of mechanical effect, amounting to $\frac{3}{4}$th parts of the total heat imparted to the boiler, and the remaining $\frac{1}{4}$th part was all the heat really converted into mechanical effect. The greater proportion of the lost heat might be utilized by a perfect dynamic engine. A vast field for practical discovery was thus opened out; but it might yet be asked whether it was worth while to leave our present tried and approved forms of engines to seek for economy, however great, in a new direction, considering the vast extent of our coal fields. The reply to this objection was that the coal, in its transit from the pit to the furnace, acquired a considerable value, which, for this country, might be estimated at £8 per horse-power per annum (taking a consumption of 13½ tons of coal, at an average expenditure of 12*s.* per ton).

Estimating the total force of the stationary and locomotive engines employed in this country at 1,000,000 nominal horse-power, it followed that the total expenditure for steam coal amounted to £8,000,000 sterling per annum, of which at least two-thirds might be saved. In other countries, where coal is scarce, the importance of economy becomes still more apparent; but it is of the highest importance for marine engines, the coals whereof had to be purchased at transatlantic stations, at a cost of several pounds per ton, to which must still be added the indirect cost of its carriage by the steamer itself in place of merchandise.

These observations, Mr. Siemens thought, might justify him in bringing before the Institution an engine, the result of nearly ten years' experimental researches, which he thought to be the first practical application of the dynamic theory of heat, of which he was proud to call himself an early disciple. Others, more able than himself, might probably have arrived sooner at a practically useful result; but he might claim for himself at least that strong conviction,

* The above article contains the substance of a lecture recently delivered at the Royal Institution.

approaching enthusiasm, which alone could have given him strength to combat successfully the general discouragement and the serious disappointments he met with.

The following illustrations, proving the imperishable nature of physical forces and their mutual convertibility, were made use of to indicate more clearly the principles his engine was based upon.

A weight falling over a pulley, to which it was attached by a string, would impart rotary motion to a fly-wheel fixed upon the same axis with the pulley, and the velocity imparted to the wheel would cause the string to wind itself upon the pulley till the weight had reached nearly its original elevation. If the friction of the spindle and the resistance of the atmosphere could be dispensed with, the weight would be lifted to precisely the same point from whence it fell before the motion of the wheel was arrested. In descending again, it would impart motion to the wheel, as before; and this operation of the weight, of alternately falling and rising, could continue *ad infinitum*. If the string were cut at the instant when the weight had descended, the rotation of the wheel would continue uniformly, but it might soon be brought to a stop by immersing it in a basin filled with water. In this case the water was the recipient of the force due to the falling weight residing in the wheel; and by repeating the same experiment a sufficient number of times, we could find an increase of temperature in the water, a fact discovered by Joule, in 1843, which first proved the identity of heat and dynamic effect, and established their numerical relation. If the weight falling over a pulley were one pound, and the distance through which it fell one foot, then each impulse given to the wheel would represent one foot pound, or commonly adopted unit of force; and if the water contained in the basin weighed also one pound, it would require 770 repetitions of the experiment of arresting the wheel in the water, before the temperature of that water was increased by one degree Fahrenheit.

Another illustration made use of was that of a hammer falling *in vacuo* upon a perfectly elastic anvil. The hammer would, under these circumstances, rebound to precisely its original elevation, and granting the perfect elasticity of both hammer and anvil, neither sound nor heat would be produced at the point of concussion. If a piece of copper were suddenly introduced between anvil and hammer, the latter would not rebound, but would make the copper the recipient of the expended force. If the hammer were now lifted again and again by an engine, and the piece of copper were turned about on the anvil, so that at the end of the operation it had precisely the same form as at the commencement, then no outward effect would be produced by the force expended, but the piece of copper would be heated perhaps to redness; and if the engine employed to lift the hammer were perfect, then the heat produced within the copper should be sufficient to sustain its motion.

A familiar instrument for converting force into heat was the fire-syringe. The force expended in compressing the air imparted a sufficient temperature to the same to ignite a piece of German tinder (about 600° Fahr.) When the plunger of the syringe was drawn back, it might be observed that the temperature of the enclosed air was again reduced to its original degree, because the heat developed in compression of the air had been spent again in its expansion behind the piston. If the expansion of the heated and compressed air had been without resistance, no reduction of its temperature could have taken place, because no force would be obtained: a fact which had been recently proved by Regnault, and which was perhaps the strongest proof in favour of the dynamic theory of heat that could be brought forward. If the heated and compressed air in the fire-syringe could be produced by some external cause, and be introduced behind the plunger after it had descended freely to the bottom, then the force imparted to the plunger in the expansion might be turned to some useful purpose, and a dynamically perfect engine might be obtained. But although the elevated temperature might be readily supplied by means of a fire, it would not be possible to give a sufficient density to the air, except by an expenditure of force in its compression. If, however, heat were applied to a drop of water confined below the plunger till its temperature was raised sufficiently to effect its conversion into steam of the density of the water itself (Gaignard de la Tour's state of vapours), and then allowed to expand below the plunger till its temperature was reduced to zero, a dynamically perfect engine would be obtained. The impracticable nature of such an engine was, however, manifest, if it was considered that steam of the density of the water producing it, would exert a pressure of probably several hundred atmospheres, which pressure the moving part of the engine must be made strong enough to bear at a temperature of more than 1,000° Fahr., and that the capacity of the working cylinder must be sufficient to allow of an expansion of the steam to several thousand times its original volume. It was, therefore, necessary to look for other means of obtaining from heat its equivalent value of force, which means, it was contended, were furnished by the "regenerative steam engine."

This engine, of which several diagrams

and a model were exhibited, consisted of three essential parts, namely, the furnace; the working cylinder, with its respirator and heating vessel; and the regenerative cylinder. It consisted also of a boiler and condenser (unless the steam were discharged into the atmosphere); but these were not essential to the working of the engine, although of great practical utility. The regenerative cylinder had for its object alternately to charge and discharge two working cylinders, and the action of its piston might be compared to that of a hammer oscillating between two elastic anvils. The regenerative cylinder communicated at its one extremity with one working cylinder, and at the other extremity with another and similar working cylinder, and these communications were not intercepted by valves. The working cylinders were so constituted that their capacity for steam of constant pressure was the same, no matter where the working piston stood. Each consisted of a cylinder of cast iron, open at both ends, which was completely enclosed in another cylinder or heating vessel, one end of which was exposed to the action of a fire. Within the inner cylinder was a large hollow piston, filled with non-conducting material, to which was attached a long trunk or enlarged hollow piston rod of nearly half the sectional area of the piston itself. This trunk was attached to the working crank of the engine in the usual manner. The trunk of the second working cylinder stood precisely opposite, and was connected with the same crank. The piston of the regenerative cylinder was also connected with the same crank, but stood at right angles to the two working cylinders. The consequence of this arrangement was, that while the two working trunks made their strokes (the one inward and the other outward) the piston of the regenerative cylinder remained comparatively quiescent upon its turning or dead point, and *vice versâ*. Around the two heating vessels boilers were disposed, which received the heat of the fire after it had acted upon the former. The steam generated within the boilers was introduced into the engine by means of an ordinary slide valve (of comparatively very small dimensions) at short intervals, and when the piston of the regenerative cylinder was in its extreme position. The admission of the steam, which was of high pressure, took place on that side of the regenerative cylinder where compression by the motion of its piston had already taken place, and at the same instant a corresponding escape of expanded steam on the other side of the regenerative piston was allowed to take place into the atmosphere. The quantity of steam freshly admitted at each stroke *did, however, not* exceed one-tenth part of the steam contained in the working cylinders of the engine, and served to renew the same by degrees, while it added its own expansive force to the effect of the engine. The compression of the steam into either of the working cylinders took place when its hollow piston stood at the bottom. While in this position the steam occupied the annular chamber between the working trunk and the cylinder, besides the narrow space between the cylinder and the surrounding heating vessel. The pressure of the steam being the same above and below the hollow piston, but the effective area below being equal to twice the area above, the working trunk attached to the piston would be forced outward through the stuffing box, while the steam of the annular chamber above the piston passed through the narrow space intervening, into a space of twice the capacity of the annular chamber below the hollow piston. During its passage the steam had to traverse a mass of metallic wire gauze or plates, the respirator presenting a large aggregate surface, which reached at one end sufficiently downward into the heating vessel that its temperature was raised from 600° to 700° Fahr., while its other extremity remained at the temperature of saturated steam, or about 250° Fahr. In consequence of the addition of temperature the steam received on its passage through the respirator, its elastic force was doubled, and it therefore filled the larger capacity below the hollow piston or displacer without loss of pressure. When the effective stroke of the working trunk was nearly completed, the regenerative piston commenced to recede, and the steam below the hollow piston expanded into the regenerative cylinder, depositing on its regress through the respirator the heat it had received on its egress through the same, less only the quantity that had been lost in its expansion below the working piston, and which was converted into dynamic effect or engine power, and which had to be supplied by the fire. The expansion and simultaneous reduction of temperature of the steam caused a diminution of its pressure from four to nearly one atmosphere; and the working trunk could now effect its return stroke without opposing pressure, and while the second working trunk made its effective or outward stroke impelled by a pressure of four atmospheres.

(*To be continued.*)

LACY'S AGRICULTURAL APPARATUS.

Mr. A. D. Lacy, of Hall House, Knayton, near Thirsk, Yorkshire, has re-

cently patented an invention which consists, in the first place, in a certain mode of constructing a trenching plough; and secondly, in the combination of the same, or of other agricultural implements, with steam or other motive power in the manner hereafter described. The plough is constructed with a strong frame of iron or other material, on which are fixed two sets of ploughshares, so arranged as that one set may be made to operate upon the ground in the forward, and the other in the backward motion of the plough. These ploughshares are also formed and arranged so as to cut the ground into furrows in the form of steps, and to throw the soil over as the plough proceeds. There are also two sets of coulters placed in the frame, adapted, as to their position and depth, to the ploughshares, so as to give the several vertical cuts to the ground at the depth at which the steps will be formed by the shares following in the previous line of the said coulters. The large coulter which always precedes the other coulter is called the tell-tale coulter, as on it must fall whatever obstruction may occur. At each end of the plough there is a mode of attachment which disconnects itself from the motive power whenever the coulter is obstructed beyond a certain extent, and the connection may be again formed by the attendant whilst remaining on the platform. The plough is fixed at the upper part of its frame to the under side of a plate which forms a kind of platform for the attendant. To this plate may be fixed other kinds of agricultural implements in substitution for this plough—such as a surface plough, harrow, seed drill, &c. The connection with the motive power is formed at each end of the plate by means of wire ropes or other suitable means, one rope being passed over or partially round a pulley, and round a barrel worked by one stationary engine, and the other rope being passed over a similar pulley and round a barrel worked by another stationary engine, one barrel winding while the other is unwinding its rope. The pulleys are respectively mounted on rails, properly supported so as to admit of their being shifted as required for working the agricultural implement over the different parts of the land; and where fences or divisions of the land occur across the line of the wire rope, and also in order to allow for the uneven surface of the ground, the wire rope will pass over a revolving pulley or bar, fixed in a wire fence in the former case, and in the latter will travel over other mounted rollers.

JOBSON'S IMPROVEMENT IN THE MANUFACTURE OF RAILWAY CHAIRS.

THE railway chairs in ordinary use have two jaws, one and sometimes both of which overhang, so that the pattern cannot be drawn directly out of the sand in which the chair is moulded. Various methods are therefore employed by means of cores of iron chill plates and other means to overcome this difficulty, and to mould the overhanging parts. By an invention recently patented by Mr. Jobson, Ironfounder, of Litchurch, Derby, the object is effected by constructing a sliding piece in the jaw of the pattern, which sliding piece forms the upper portion of the overhanging part, and is drawn back in a diagonal direction after the sand has been rammed round the pattern. A space or cavity is thus left into which the lower portion of the overhanging part of the jaw is turned back, this lower portion being mounted upon a pin or hinge for that purpose. The sliding piece is made to give the required motion to the hinged piece, so that by merely drawing back the sliding piece the whole of the overhanging part of the jaw is relieved and withdrawn from the sand into such a position that the sand mould can be lifted at once from off the pattern. If an overhanging part is required on the other jaw of the chair that jaw is constructed in a similar manner. In order to separate the sand mould from the pattern without the danger of injuring it, the patentee employs a metal plate or frame, having an aperture which fits the base of the pattern of the chair. This plate is capable of being raised by means of a cam or cams at each end, or by levers, screws, or other means, so arranged and connected that the plate is raised equally and simultaneously at all parts. The moulding box is placed upon this plate or frame to which it is fitted, and the sand is rammed in. The sliding piece or pieces of the pattern are then drawn back as before-mentioned, and the plate is then raised a little, by which means the sand mould is raised and detached from the pattern. The mould being then free and out of contact with the pattern is lifted off. The mould of the bottom of the chair is moulded in any of the ordinary manners, and the two moulds are placed together forming the perfect mould for the casting of the chair. The patentee is thus enabled to lift the mould off the pattern without the necessity of turning the box over, and rapping the pattern, and picking it out of the sand as ordinarily practised, and the operation of moulding is thus rendered simple and expeditious. The form and arrangement of the moveable part or parts of the pattern admit of variation, provided that they be such as to admit of the mould being lifted off the pattern.

SANDERSON'S IMPROVEMENTS IN THE MANUFACTURE OF IRON.

Mr. Charles Sanderson, of Sheffield, has recently patented an invention which consists in the decarbonization of raw or crude pig iron melted on the bed of a reverberatory furnace, or obtained in a molten or fluid state direct from the blast furnace, by adding to such melted metal any chemical re-agent, which, by its decomposition, will evolve elements capable of combining with the carbon, and reacting upon silicon, aluminium, sulphur, phosphorus, arsenic, or other deleterious substance or impurity contained in the iron, and will, by the generation of carbonic oxide or carbonic acid gases (which will not combine with the iron, and will necessarily fly off or enter into combination with the scoria and earthy matters), cause them to separate from the iron, the impurities contained in the metal being thus got rid of, either by volatilisation, or by reason of the difference in the specific gravity of the various substances. Also, in the use of sulphate of iron, or its chemical equivalent, for the required purpose, by adding it to cast iron when it is being melted, for the purpose of producing castings of beams, shafts, and other articles requiring a particularly good iron, and thereby purifying such metal by discharging the earthy and other deleterious matter contained therein, and adding greatly to the strength of such castings.

FOREIGN INTELLIGENCE.

Preservation of Timber.—The characteristic of vegetable beings (plants) is that they receive various substances within their tissue, as well by endomosis as exomosis, without any choice or predilection. This has been tried with living trees, and the substances employed were such as prevent decay and putrefaction, as creosote, sulphate of copper, &c. M. Boucherie first patented the process, and the licence for using it had been purchased by the telegraphic lines for 10,000 fr. At the present moment, however, 190,000 telegraphic poles stand up in France. The oldest posts thus preserved exist since 1848; and the *Constitutionnel* says that this process has saved millions. The North line has prepared its sleepers in the same way, and they are said to be now as they were in 1846. M. Boucherie has applied for an extension of his patent right.

New Patterns for Goldsmiths and Jewellers. — The Russian Government have published one of the most splendid works ever issued from the press, "Antiquités du Bosphore Cimmerien;" Antiquities of the Cimmerian Bosphorus (Crimea), preserved in the Museum of the Hermitage. St. Petersburg, at the printing office of the Imperial Academy of Scien es, 1854, seqq. 3 vols. fol. plates. As it is only intended as a present to princely personages and public institutions, the Goldsmith's Company will obtain a copy by applying to Lord Clarendon. There are above twenty-two gold crowns, formed of leaves, represented in the work, besides a breast ornament, composed of several rows, of the finest workmanship, and adorned by a central piece, most probably after the designs of Phidias. There can be no doubt that the gold fields of antiquity were situated close by, judging from the treasure of gold and silver found by the Russians in the ancient buildings of the Crimea.

[*Communicated by Dr. J. Lotsky.*]

THE STEAM ENGINE AND ECONOMY OF FUEL.

To the Editor of the Mechanics' Magazine.

Sir,—It is a general opinion that the great duty of a Cornish engine is altogether attributable to very high pressure with great expansion. I annex an abstract table from Wicksteed's experiments, which are generally considered the most accurate. This table shows a consumption of only 2·27 lbs. of Newcastle coals per horse power per hour; with a steam pressure in the cylinder of only about 5 lbs. above the atmosphere, cut off at one-third of the engine's stroke. Now, if this great duty were obtained by the ex-

Absolute pressure of steam in boiler.	Temperature of steam in boiler and steam jacket.	Absolute pressure of steam in cylinder before cutting off.	Length of stroke before cutting off steam in feet.	Length of stroke after cutting off steam.	Lbs. of water actually raised one foot for each lb. of steam.	Lbs. of water raised one foot for each lb. of Newcastle small coal.	Lbs. of small Newcastle coal consumed per hour per horse power.
30·45	252	14 66	6·03	3·97	73,906	628,201	3·15
34·7	260	15 95	4·77	5·23	86,176	732,496	2·70
42·7	272	18·19	3·97	6·03	89,831	763,763	2·59
45·7	277	19·69	3·52	6·48	93,058	790,993	2·53
51·7	284	20·17	3·13	6·87	101,820	865,470	2·21

pansion of the steam in the cylinder alone, we should greatly surpass the Cornish engine with the double cylinder engine; but we all know to the contrary in practice.

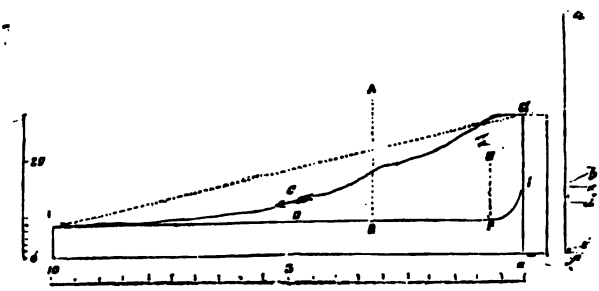
The expansion of isolated steam in a cased cylinder looks very well in figures, but our advocates of the wire-drawn steam system can also show great results in figures, and it is well known that the effect of wire-drawn steam is not to be compared in practice to the results obtained by the expansion or intermittent system, showing that a regular flow of steam from the boiler is quite contrary to economy of fuel.

The following are a few of the many cases in which this is shown:

It is well known that when two engines are coupled together with their cranks at right angles to each other, they perform a less amount of duty than any single engine of the power of both. When any accident happens to one of the engines to cause its disconnection, the other engine thus working alone, a greater per centage of duty has been the result in all cases. This has been very often remarked with marine engines.

Two factory engines, which I had occasion to notice some time ago, were working together with their cranks at right angles to each other, both receiving steam from the same set of boilers. These engines were altered, with the intention of lessening a noise in the gearing. The cranks were set so that both were on the centre at the same time. The result of this alteration was a saving in fuel of about 2 tons per day. I thought this very wonderful at the time, as there was no alteration in any other part of the engines. The slide valves are common D slides, and give steam nearly throughout the stroke. When two such engines are working with their cranks at right angles to each other, the flow of steam from the boiler is nearly regular; the intermittent action is, therefore, not taken advantage of. I have now no doubt that the separating of the boilers would have given the same result. I annex a diagram of the action of the steam pressure in the Old Ford engine, as given by Pole, in his treatise on the Cornish engine.

The boiler pressure is represented by *a f*, the atmospheric pressure line being at *b*; the mean pressure on the piston at *c*; the water load at *d*; the condenser pressure at *e*; and the perfect vacuum point at *f*. The horizontal divided line represents the length



of stroke in feet, and the vertical divided line the pressure in pounds per square inch. The in-door stroke is represented by the line, G G H, and the out-door stroke by the line, H D F G. The line, A B, indicates the period of cut off; the line, E F, the period of closing the equilibrium valve; and I, the clearance space.

At the termination of the stroke the pressure is about 6·5 lbs. Mariotte's law would give a pressure of about 5·8 lbs., while Pambour's rule would give 5·1 lbs.

We need not wonder at this extra pressure when we know that the cylinder is kept at a much higher temperature by the *steam in the jacket*. Deduct that which is *taken by the expanding steam* from the higher steam in the jacket, and Pambour's rule will then show itself the most correct. Any heat taken from the jacket in this manner is therefore no gain, as the steam in the jacket must have lost as much heat as the expanding steam has received. On the diagram I have added the dotted line, G H, to represent the figure which would be produced by wire-drawn steam, its pressure gradually diminishing until the termination of the stroke. This gives a mean pressure of about 17·75 lbs., with a cylinder full of steam at the same pressure as that produced by the cut-off. Now our advocates of the wire-drawn system have been criticised and abused because the result which they had shown in figures only was not obtained in

practice. This has led many eminent engineers to deny that any gain could result from expanding isolated steam in a cased cylinder. We may add a non-conductor to the outside of a cylinder, but we cannot in the inside. A certain amount of caloric must therefore be radiated into the condenser, which no doubt accounts for the extra water required for condensation. The pass of steam from a good piston does not account for this extra quantity of water required for condensation. Pole, in translating Alban's work on the high-pressure engine, adds that the experiments in Cornwall have just sufficed to show a gain in favour of the steam jacket, and no more. In his own treatise on the Cornish engine he mentions that no experiments on the quantity of water evaporated in a given time, by a certain amount of fuel in the Cornish engine boilers, are trustworthy; and he unhesitatingly adds, that Wicksteed's experiments are unreasonably high.

Wicksteed's experiments are generally considered the most extensive, faithful and accurate ever recorded, and I do not think the greatest evaporation mentioned is anything beyond the truth, and in a short time engineers, will arrive at a greatly superior result, however far they may be behind at present.

Pole also recommends the plan of separating the consideration of the boiler from that of the engine, as long ago done by Smeaton and Watt. As this was the rule adopted by these highly eminent engineers, it was natural for others to adopt the same, as they were, no doubt, our true leaders in other respects at least. I cannot agree with them, however, on this point, and beg to offer my opinion to the contrary, as I consider the boiler the chief organ of the engine, and that all must agree and be considered as one.

This is the path the Cornish engineers have accidentally entered, and the great duty their engines have realised is a proof of their being on the right track. We at present differ very far from them, as, I may say, they have a separate boiler for each single stroke of the engine. Now, our marine engines have only one boiler (or set of boilers) supplying two double-acting engines. And it is very well known, that any attempt to save fuel, by expansion in these engines, has as yet failed, and in some instances proved quite injurious.

Several instances of diminishing the volume of water in steam boilers have proved successful when a single engine has been supplied by its own boiler independently of any other engine's boiler.

Waggon boilers in these circumstances have been greatly *improved by inserting* an uptake flue and dispensing with the hydrostatic feed pipe; but where two or more engines are supplied by steam from the same set of boilers, the intermittent action cannot come into play, and the alteration would show very little benefit in practice. In Watt's engines with the hydrostatic feed pipe, the intermittent action could not be fully taken advantage of, even had it been attempted. The whole of our present boilers have too much water in them as compared with the steam space. If the water can be lowered without allowing the fire in the flues to come into direct contact with the steam space, and the steam pressure raised, which amounts to enlarging the steam space, the engine working expansively and receiving steam exclusively from its own boiler, a saving of fuel will undoubtedly be the result. If the water in the boiler is lowered, so that the fire is in contact with the steam space, the engine will then show itself defective. I will allude to this in a future article. I hope that these instances show sufficient reason why each engine should have its own boiler distinct. If this rule were adopted the best proportions of boilers would soon be arrived at. It is quite impossible for engineers to arrive at the best proportions when the boilers are as at present, and act differently accordingly as they supply two engines at right angles, or two engines on the same centre. I propose to use a division or boiler for each single stroke of the engine, that is, two boilers for one cylinder, or one boiler distinctly divided in two, and each end of the cylinder supplied from its own boiler, so that the one boiler can be rising in temperature, while the other is discharging. And if the steam and water spaces are in proportion, as already explained, they will continue to boil until the opening of the valve into the cylinder relieves the pressure, when the excess of caloric will immediately form steam in proportion to the excess of heat the water contains. I have found that water, in certain conditions, receives, retains, or transmits, heat as already mentioned; and if the steam space is made of sufficient capacity to contain the volume of steam produced, by a certain consumption of fuel in a given time, and if the volume of water is so reduced, that that same fuel which converted the water into steam, was also capable of raising the volume of water to the corresponding temperature in the same time, tables of which are given by Dalton, and in almost every work on the properties of steam.

If the proportions do not agree in the manner I have indicated, the water in an expansive engine boiler will cease to boil before the opening of the induction valve.

During that time the flame cannot wait until the water is ready to partake of its heat, and it is therefore discharged into the chimney for nothing.

I have read of many experiments on the Cornish boilers. The temperature in the flues have been measured by a thermometer placed therein. The Cornish engines have too much water in their boilers still; it will therefore cease to boil before the opening of the steam valve for the in-door stroke, and the temperature in the flues will vary considerably during a full stroke of the engine, as the temperature of the flues will be reduced during the time the steam valve is open.

The Cornish engine boilers would not be of the proper proportions of steam and water spaces, if the steam pressure therein were at the same pressure as that required in the cylinder; but the pressure in the boiler is much higher than that admitted into the cylinder, which amounts to the same thing as an enlargement of the steam space. I have already said that the higher the steam pressure is, the greater should be the volume of water as compared with the steam space. Thus, the Cornish engineers, by inserting flues in the water space, and adopting a higher pressure of steam, thereby enlarging the steam space, have, by mere experiment, arrived at nearly the right proportions of steam and water spaces for the degree of expansion adopted—showing how far the most of our double acting engines are from the proper proportions to work expansively with economy. Our advocates for the single-acting engine will be, I hope, agreeably surprised by the double-acting engine surpassing any single-acting engine, as I have no doubt will soon be the case. If there is any advantage in having a condenser for every alternate single stroke of the engine, we can easily add another condenser to the double-acting engine; and each condenser will then serve its own single stroke of the engine, as in the Cornish engine.

I have some alterations in contemplation, and will furnish you with the particulars when completed. If any of your readers adopt the alterations I have mentioned, I beg they will furnish you with the result, as I and those of your readers who feel interested will make such welcome.

I am, Sir, yours, &c.,

ALEX. MORTON.

Glasgow, July, 1856.

FLYING BY MAN.

To the Editor of the Mechanics' Magazine.

SIR,—It is a strange observation, that that very attempt of human ingenuity should have *not* yet been achieved, upon which even the attention of the earliest times turned. The myth of *Icarus* must be one of very ancient date, as its imagery is so very simple. That wings should have become useless because of being fastened together with *wax*, ignores the existence of pitch and bitumen, with which even the walls of Babel had been constructed. And there the matter rested until the time of the first French Revolution, when chemistry had taken a start quite into novel modalities of matter and design. Since that period (1789), numberless attempts have been made, that, as man *can* now *elevate* himself in the air, he might be also able to give some direction to that elevation. All these attempts have been mainly unproductive,—some remarkable for their utter stolidity and impudence. Amongst those I reckon the "Aërial Transit Company's," started some ten years ago, in London, and which issued a plan for an aërial ship of the kind, &c.

My plan, on the other hand, is one of a perfectly experimental and initiative character. I propose to make fly (at first) a slim lad, of thirteen or fourteen years of age, from a platform erected on the upper terrace of the Crystal Palace, or any similar establishment, which may take the matter in hand. I believe that such an individual will be able to fly to the end of the grounds, and even a little further, and that it will be possible that he may diverge from the straight, and also from the horizontal line. The floating of the body I intend to accomplish by an aërostatic apparatus; the direction by a peculiar sort of wing apparatus. Both these would be patented, as there would be legions of people in all parts of the world eager to see such a startling spectacle. My invention also differs from that of others, in that it was hitherto thought that any apparatus for flying being found, *the* flying must come *ipso facto*, as if every good violin was to make a player. My invention is intended to afford the apparatus; but how the apparatus is to be properly used, is to be learned. The cost of one of my flying machines would be £150 or £200; the first somewhat more.

One of the few persons to whom I communicated my plan, although then not quite matured, was the late Marquis of Northampton, P.R.S. I saw him once or twice, for a considerable length of time. The late lord seemed so much to assent to the correctness of my plan, that he ex-

pressed a fear lest it would endanger private property; but one must be as wealthy as the late marquis was, to apprehend that thieves will buy apparatus, learn to fly, &c. I, therefore, leave my invention trustfully in the hands of the English public.

I am, Sir, yours, &c.,

J. Lotsky.

15, Gower-street, July, 1856.

CAPTAIN NORTON'S SUBMARINE BEELZEBUB.

To the Editor of the Mechanics' Magazine.

Sir,—I this day successfully tested my submarine exploding beelzebub on the river near Rosherville landing place. A large block of wood, in the form of an Ordnance mortar, had a paper shell, charged with gunpowder, placed in its hollow chamber, and one of my waterproof igniting corks was attached to the paper shell. A strong cord about 5 feet long was tied to the eye of the twisted wire which passes through the cork, and at the other end of this cord a stone was tied of sufficient weight to form a sort of anchor or drag. The block of wood thus prepared was let down into the water from the stern of the boat, and as the block was carried by the wind and wave into more shallow water, the stone caught the bottom, and by the consequent drag or pull on the frictional-wire, fired the shell. A cordon of such wooden mortars, or rafts, having bottled-shaped glass shells, charged with Mr. Wentworth Scott's liquid fire, and connected together with cord, might be sent on a mission among a hostile fleet at anchor, wind and wave being propitious, and it would be very hard if this band of attached beelzebubs did not ivy-like embrace some one of the fleet, and by the strain on the cord, fire the shells, when a shower of the liquid would fall on the sails, shrouds and deck of the "lofty man-of-war." This wooden mortar or raft may also be used as a signal of distress by a vessel wrecked at a distance from the shore; the shell may be merely a paper one made waterproof by paint or varnish. The report and flash of the exploded shell *near* to the shore would give notice of the wreck, when guns fired on board could not be heard in the uproar of the storm.

I am, Sir, yours, &c.,

J. Norton.

Rosherville, July 3, 1856.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

Whitehouse, E. O. W. *Improvements in electro-telegraphic apparatus, parts of which are also applicable to other purposes.* Dated Nov. 20, 1855. (*No. 2617.*)

This invention relates—1. To the apparatus employed in obtaining electric currents by induction, and which may be termed induction coils, and consists in placing the secondary coil nearest the iron, and the primary coil which is connected with the battery outside the other or secondary coil. 2. To improvements in the instruments or relays used for receiving alternating currents, either from a distinct station or on home circuit, so as to call into play a local battery of any required form or strength. 3. To combining a dead beat magnetic needle instrument, with a relay fitted to receive alternating currents. 4. To the adaptation of an ordinary step-by-step action dial instrument of a peculiar releasing or retrograde movement.

Price, D. S., and E. C. Nicholson. *Improvements in the manufacture of cast iron.* Dated Nov. 20, 1855. (No. 2618.)

These improvements consist in melting together any kind of grey iron with the product of the intermediate process in the manufacture of wrought iron from pig iron, usually termed metal finer's metal, or refinery metal. The object is to lower the per centage of silicon in cast iron, whilst the total amount of carbon therein remains about the same.

Price, D. S., and E. C. Nicholson. *Improvements in the manufacture of cast steel.* Dated Nov. 20, 1855. (No. 2619.)

This invention relates to the production of cast steel, by melting together the product of the refinery process of cast iron, known as the metal finer's metal, or the refinery metal, with suitable proportions of wrought iron.

Maggs, O. *Improvements in machinery for thrashing and winnowing wheat and other grain.* Dated Nov. 20, 1855. (No. 2620.)

In constructing the winnowing apparatus of a thrashing machine, and also of a winnowing machine, two riddles or sieves are employed, one above the other; but in place of allowing the grain to fall from the upper sieve or riddle directly on to the lower one, an inclined partition is employed, to which the grain from the upper sieve or riddle falls, and by it the grain is conducted to the end of the lower riddle or sieve, and streams of air from a blowing machine are directed over and between the riddles or sieves as heretofore. In constructing the shaker of a thrashing machine with rotary rakes, in place of having all the rotary rakes of the same diameter, some are made of larger diameter than the others. Below the rotary rakes there is an incline, down which the grain which is shaken out descends to the lower winnowing apparatus as heretofore. The best grain from the lower winnowing apparatus is conducted directly into a

hummeller, and from it is discharged into the elevator which raises it to the upper winnowing apparatus. The other matters from the lower winnowing apparatus are conducted by another elevator back to the drum to be again thrashed. Over the lower part of the shaker and over the drum is placed a cover wire cloth or work, by which the currents of air are allowed to pass, whilst the grain, &c., fall back on to the shaker.

TOLSON, G. S., R. H., and J. S., and T. IRVING. *Improvements in producing metallic lustre to yarns and fabrics.* (A communication.) Dated Nov. 20, 1855. (No. 2621.)

The nature of this invention may be ascertained by reference to the Lord Chancellor's judgment, given on page 562 of our last volume (No. 1714).

DEFRIES, C. *Improvements in the roof-lamps for railway carriages.* Dated Nov. 20, 1855. (No. 2622.)

This invention consists of applying to such roof-lamps glasses cast with undulations, with a view to break up the surface of the glass into numerous prisms or elevations and depressions, which will cause the light within to be broken up. The patentee fixes the glass in a ring or frame, made readily moveable from the upper part of the lamp by spring or sliding catches, and on the interior of the carriage a concave reflector is used, through the centre of which the glass of the roof-lamp passes.

FONTAINEMOREAU, P. A. L. DE. *Improvements in treating fatty acids.* (A communication.) Dated Nov. 21, 1855. (No. 2626.)

Braconnet has demonstrated that if a certain quantity of concentrated sulphuric acid is applied to grease and oils, an instantaneous combination takes place, and that boiling water separates the sulphuric acid, and allows the greasy matter to rise to the surface decomposed. The product thus obtained is a greasy acid in an imperfect condition, which cannot be purified, and its solid and liquid elements cannot be separated, except by repeated treatment by alcohol, essence of turpentine, or ether. This operation is therefore not capable of producing a manufacturing result. These facts led to the idea of rendering available this effect of sulphuric acid by substituting for the use of alcohol, ether, and the essence of turpentine, the manufacturing process of distillation, for purifying the greasy acids, and extracting therefrom the stearic and oleic acids of commerce, and it is in this that the invention consists.

MUNSLOW, W., and H. WALLWORK. *Improvements in railways.* Dated Nov. 21, 1855. (No. 2627.)

The object of this invention is to afford the means of restoring the position of the rail when its bed in the chair becomes worn. Between the lower edge of the rail and the chair an adjusting loose piece or key is introduced, and is formed as a clip. One side of the loose piece beds against the jaw or cheek of the chair, and the other is forced against the rail by means of a wedge or key, on its being driven up in the direction of the rail. The key or wedge is kept in the horizontal position by a projecting part formed in the chair. A loose piece is let in, and extends across to the width of the chair, and is secured to the same by means of V-shaped or dovetailed edges or sides. When the abutting ends of two rails are introduced between the side clips, and the chair is in the proper position, the wedge may then be driven up.

WIMSHURST, H. W. *Improved machinery for cutting dovetails and tenons.* Dated Nov. 21, 1855. (No. 2628.)

The main features of this invention consist—1. In presenting the wood to be cut to the action of a series of rotating cutters by means of ascending tables. 2. In the application of counterpart cutters, fitted on the extremities of a series of rotating spindles, mounted in a fixed frame.

TOLHAUSEN, A. *Certain improvements in bombs and other explosive projectiles whose charges are to be fired by percussion.* (A communication.) Dated Nov. 22, 1855. (No. 2630.)

This invention consists in certain means of providing for the explosion of the projectile by percussion, and in giving to it a certain form, whereby its flight is so directed that it must strike on the proper part, and is caused to explode laterally in all directions.

ROBERTS, J., junior. *A machine or apparatus for cooling tobacco during the process of manufacture.* Dated Nov. 22, 1855. (No. 2631.)

The patentee causes an open receptacle to be mounted upon a frame, and a partition of wire gauze to be placed horizontally within for the tobacco to be placed upon, leaving between the bottom of the receptacle and the wire partition a space to enable the cold air to circulate. By means of a common blowing fan and a spreader, the current of cold air is diffused over the tobacco.

PRICE, G. *A box, chest, or case for the preservation of parchment deeds and documents from damage by steam, when placed inside an iron safe made fireproof on the vaporizing principle* (Milner's patent, 1840.) Dated Nov. 22, 1855. (No. 2632.)

This invention consists of making a box, and coating the interior with a preparation of caoutchouc; the lid or door is to be made with a flange, upon which is to be fastened

a layer of India-rubber, and made to fit close into the inside of the box.

DUNLOP, C. T. *Improvements in the manufacture or production of artificial oxide of manganese.* Dated Nov. 22, 1855. (No. 2637.)

This invention relates to the application of the residuum of the chlorine manufacture, commonly consisting of chloride of manganese, and consists in using carbonate of lime to convert the chloride of manganese into carbonate of manganese, and in subsequently converting this carbonate of manganese into peroxide of manganese.

MAY, C., and P. PRINCE. *Improvements in the manufacture of spikes and treenails.* Dated Nov. 22, 1855. (No. 2639.)

This invention consists—1. In the manufacture of hollow iron spikes or treenails, in which the metal is not of uniform thickness, that portion which forms the head being of greater substance than that which penetrates the wood; the form of the last-named part resembles the shape of a quill toothpick, and readily drives into the wood without requiring a hole to be previously bored. 2. In rolling the iron of such sections as will allow of cutting out the blanks for forming the spikes or treenails with economy. 3. In machinery for manufacturing such blanks into their intended shape.

TUCKEY, T. *Modes of construction by which steam or other vapour or gas may be used as a source of motive power for some purposes more conveniently than hitherto, and more suitably for locomotion on common roads.* Dated Nov. 23, 1855. (No. 2640.)

The patentee proposes to substitute for cylinders or pistons, vessels or bags, partly or entirely of flexible impervious material, which shall be alternately dilated and contracted by the entrance and departure of steam.

LACY, A. D. *Machinery or apparatus for agricultural purposes, to be used in combination with stationary steam power.* Dated Nov. 23, 1855. (No. 2641.)

A description of this invention is given on page 57 of this Number.

FISHER, J. P. *Certain improvements in the construction of the hammers of pianofortes.* Dated Nov. 23, 1855. (No. 2642.)

The patentee constructs the head of the hammer which strikes the string in a separate piece, so as to admit of being removed and replaced; or he constructs it so as to admit of being reversed or shifted, to present a fresh face for striking.

HUTCHINSON, J. H. *Improved machinery for converting rectilinear motion into rotary motion.* Dated Nov. 23, 1855. (No. 2643.)

The patentee connects the piston rod to a sliding frame in which he mounts two ratchet wheels, each having *two sets of ratchet teeth,* set in opposition, so that in whichever direction the wheels are moved round, they may be stopped by clicks. Suspended above these wheels, and from the sliding frame, are two pairs of clicks or holdfasts, one pair of which is let down at a time into contact with one of the sets of teeth of the ratchet wheels, to prevent the wheels from turning in their bearings according as the rotation is required to the right or to the left hand. A shaft connected to the main driving shaft to be set in motion passes through the bosses of the ratchet wheels, and is provided with helical grooves into which teeth projecting from the boss of each ratchet wheel respectively take. As, therefore, a reciprocating motion is imparted by the action of the piston rod to the frame which carries the ratchet wheels, the driving teeth of the wheels, as they are alternately held fast by the clicks, will, by moving along the helical grooves of the shaft over which the sliding frame traverses, impart rotary motion thereto.

ELLISDON, J. *Improvements in "castors" for cabinet-furniture.* Dated Nov. 23, 1855. (No. 2644.)

In the improved castors the vertical pin or bearing upon which the horizontal rotating arm works is tapered in order to maintain a perfect contact between the two parts when reduced by wear. And the travelling wheels (of which there are two on each castor, one being mounted on each side of the outer end of the horizontal rotating arm) have no tendency to come off their axles, by reason of their axle arms, upon which they are mounted, being so formed as to project slightly downwards, which also causes the soles of the wheels to be brought nearer together, thereby facilitating the turning of the castor within a limited space.

JOBSON, J. *Improvements in the manufacture of railway chairs.* Dated Nov. 23, 1855. (No. 2645.)

A description of this invention is given on page 58 of this number.

LESTER, S. C., and J. WARBURTON. *Improvements in spinning.* Dated Nov. 23, 1855. (No. 2646)

These improvements relate to the counter or under motion, which gives the necessary tension to the yarn in self-acting mules, and consist in placing upon the counter or under faller a lever, say 12 ins. long, and arranged so as to ride upon what is called a shaping-bar. This is so formed as to allow the counter faller to rise or fall at any point by the backing or winding on. Below is a second faller or drag wire to give a proper tension to the yarn when winding on, which is regulated by the under faller or shaping-bar; this wire acting at a suitable angle, and close up to the cop or

bobbin, allows of the yarn being hard wound on without laying stress upon the other part of the yarn. Another improvement consists in constructing the spindles and throstle spinning frames so that the upper parts thereof, whereon the spools are placed, are made much thinner than is now the case, &c.

ELCE, J., and G. HAMMOND. *The employment of a new material in the manufacture of wicks for moderator-lamps.* Dated Nov. 24, 1855. (No. 2647.)

"Asbestos" is the "new material" mentioned!

CARRINGTON, S. R. *Certain improvements in the manufacture of hats.* Dated Nov. 24, 1855. (No. 2648.)

These improvements consist in making the "pad" of an absorbent material or fabric, and a repellent or non-absorbing material, the object being to obtain a yielding substance to fit the head, and to absorb perspiration, and to prevent it passing through the pad to injure the hat.

LOBSTEIN, J. *Improvements in sewing-machines.* Dated Nov. 24, 1855. (No. 2649.)

With the new sewing-machine it is possible to form tubular pieces, either open at both ends or at one end only. Instead of turning the article to be sewn round the machine, when a curvilinear sewing is required, it is the cloth holder which is moved round the needle, so as to drive it in the direction of the required curve. This portion of the machine constitutes one of the chief improvements.

MARTIN, J. *An improved self-acting incubator.* Dated Nov. 24, 1855. (No. 2652.)

The action of the improved incubating apparatus is as follows:—Water is poured into one of certain cylinders or water-vessels, and flows through hollow shelves beneath the egg-trays, and into a cylinder on the opposite side. When the cylinders are nearly full, lamps are lighted. As the temperature of the water rises, the air within a glass expands, and depresses mercury contained within a chamber; this causes the float to rise, and act upon a lever attached to a chain or wire of a valve. Should the heat of the lamps cause the temperature to rise above 105° Fahr., the float will be sufficiently elevated to act upon the lever of the valve, and raise it from its seat; this causes a quantity of cold water to flow down the pipe into the cylinders, which immediately reduces the temperature to the proper degree.

SANDERSON, C. *An improvement in the manufacture of iron.* Dated Nov. 24, 1855. (No. 2653.)

A description of this invention is given *on page 59* of this Number.

HYDE, H. Improvements in the manufacture of mineral oils. (A communication.) Dated Nov. 24, 1855. (No. 2654.)

This invention relates to a mode of obtaining a new preparation of oil from mineral hydrocarbons, or the well-known distillates of such substances. It consists—1. In the application of improved chemical methods in the separation and subsequent purification of oil obtained by decomposing fluid and semifluid petroleums, so as to obtain a definite and useful oil from any number of this class. 2. In producing from the various solid bitumens, oils having highly unctuous qualities, and high boiling points, which permit of their being used alone, or with other oils for lubricating machinery.

MARGUERITTE, L. J. F. *Improvements in precipitating certain salts.* Dated Nov. 26, 1855. (No. 2655.)

This invention relates to that property which certain substances have of precipitating from their dissolution various salts, such as the chlorides of potassium, sodium, ammonia, barium, the carbonate of sodium, &c. If, for instance, a current of chlorhydric acid gas is let to a full saturation into a dissolution consisting of chlorides of potassium and of sodium, these two salts will be almost entirely eliminated from the liquid. By this means the vaporizing of saline substances will be dispensed with.

JONQUET, D. *Improvements in the blades of mechanical cutting machines, and in the blades of single or double-handled cutting instruments, and in the blades of ordinary and mechanical shears and scissors, and in the handles and springs for the same.* Dated Nov. 26, 1855. (No. 2656.)

This invention consists in the application to mechanical shears and to reaping machines, of ordinary circular blades and of notched circular blades, and also of other kinds of notched blades, and to shears or scissors of grooves or gutters placed at the handles or at the blades, to prevent the blades swerving laterally from each other; also of hinges on the handles of the shears or scissors; also in adjusting or perfecting springs, the force of which can be regulated at pleasure, and made on the principle of a see-saw, &c., &c.

WILKES, J. G. *Improvement or improvements in the manufacture of tubes of copper and alloys of copper.* Dated Nov. 26, 1855. (No. 2657.)

This invention consists in forming the said tubes by passing hollow cylinders between rolls furnished with grooves of a nearly semicircular section, the grooves being somewhat less deep than they would be if their section were truly semicircular.

HARRISON, E., and H. GREAVES. *Improvements in the manufacture of woven fabrics.* Dated Nov. 26, 1855. (No. 2658.)

This invention relates to a peculiar arrangement of the warp and weft threads, by making what is technically called the cord or tie up at certain irregular intervals.

COIGNET, F. *Certain improvements in the use and preparation of plastic materials or compositions to be used as artificial stone, or as concrete or cement for building and other purposes.* Dated Nov. 26, 1855. (No. 2659.)

These improvements relate to various combinations of sands, gravel, broken flint, broken stone, burnt or unburnt soil, cinders, and coal refuse, scoria, wood-ash, dross, with unctuous or hydraulic chalk, &c., and very fine sand, and in the employment of such matters when compounded in the formation of houses and other buildings. The matters to be mixed are pounded together, and when used, the desired forms are given by moulding and compression on the wall or other formation, repeating the operation till the structure desired is obtained.

OSBOURN, F. *Improved machinery for pressing, smoothing, or finishing garments or parts of garments.* Dated Nov. 26, 1855. (No. 2661.)

This machinery is for pressing the seams of garments. The patentee constructs a machine consisting principally of a long framework to which a moveable board is adapted for receiving the articles to be pressed, and above this table is mounted a metal pressing surface, made hollow for the purpose of being heated internally. The articles to be operated upon must be fixed on a flat board or other surface before being placed in the machine.

DERING, G. E. *Improvements in galvanic batteries.* Dated Nov. 26, 1855. (No. 2662.)

Claims.—1. The use of a mixture of hydrochloric acid with nitrate of soda, or nitrate of potash, or other suitable nitrates, as an exciting liquid in galvanic batteries. 2. The application of a granular coating of platinum, or other suitable metals negative to copper, to the surface of copper and its alloys, for the purpose of improving their qualities as a negative element in batteries. 3. The turning over towards the inside the upper end of the containing vessels of galvanic batteries, and the employment of floats of gutta percha, or other suitable material, upon the surface of the liquids of galvanic batteries, for the purpose of preventing the spilling of the same.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

PREECE, W. H. *Improvements in electric telegraphs.* Dated Nov. 19, 1855. (No. 2608.)

This invention consists in arranging electric telegraphs to communicate in both directions at the same time on the same wire. According to it, the force of the local current is not adjusted, but in place thereof its influence is increased or diminished, as required, by altering its distance from the needle or other instrument on which it is arranged to act.

SCHWARTZ, T. *Improvements in drying, heating, and melting solid and plastic bodies.* Dated Nov. 20, 1855. (No. 2609.)

This invention consists in enlarging the surfaces of solid or plastic bodies to be dried or heated, or of vessels or other receptacles used to convey or reverberate heat to solid or plastic bodies to be dried, heated, or melted, by corrugating, grooving, or forming projecting ridges or ribs upon them.

POOLE, J. *An improved mode of regulating the supply of steam from the boiler to the cylinder, and thereby better governing the motion or speed of steam engines.* Dated Nov. 20, 1855. (No. 2610.)

The inventor proposes to regulate the supply of steam by means of the steam itself, and for this purpose he applies sliding discs, plates, valves, or pistons within the tube or box which conveys the steam to the cylinder, so that when the pressure of the steam in the boiler becomes, from any circumstance, greater than that in the cylinder, these discs, &c., shall be pressed forward and diminish the orifice through which the supply passes.

GEYELIN, G. *Propelling vessels by means of pistons, which he calls Anti-friction Propellers, to supersede paddle-wheels, screws, and all other contrivances at present in use.* Dated Nov. 20, 1855. (No. 2611.)

The inventor affixes to the ship, and flush with the outer side of the vessel, steam cylinders, or cylinders, worked by means of steam or other power. These cylinders being open on the side of the water, the piston is in immediate contact with the water, and by its forward and backward motion the propelling power is obtained.

COOKE, W. *Improvements in gas and solar light reflectors.* Dated Nov. 21, 1855. (No. 2624.)

The inventor constructs his reflectors of two or more pieces of glass or transparent material, of similar shape and size, between which are placed sheets of highly polished copper, tin, silver, or other reflecting medium.

MARCESHEAU, A. J. B. L. DE. *Improvements calculated to increase the efficiency or working power of steam engines.* Dated Nov. 21, 1855. (No. 2625.)

The inventor disposes a cylinder so that it may move to and fro along the cylindrical surface of an immoveable pipe, the top of which should never be in contact with the bottom of the cylinder. This constitutes the main feature of the invention.

TREEBY, T. W. G. *Improvements in revolving fire-arms.* Dated Nov. 21, 1855. (No. 2629.)

According to this invention the end of the barrel is caused to pass some distance over the end of the chamber. The barrel is arranged so as to slide forward away from the chamber after the discharge of the fire-arm, so as to let the discharge chamber be moved out and another into position, when it is again slid back. This motion is given to the barrel by a lever and connecting link. To the same lever is also attached another connecting link which passes to the tail of the hammer, so that the motion of the lever for working the barrel also raises and cocks the hammer. The invention also comprises an arrangement for rendering revolving fire-arms self-capping.

CALVERT, E., and S. A. SMITH. *Certain improvements applicable to carding-engines.* Dated Nov. 22, 1855. (No. 2633.)

This invention consists in a mode of casing the lower part of the carding engine, so as to prevent or diminish the currents of air. One mode is by placing two upright partitions below the main cylinder, so as to divide the under side of the carding engine into three spaces; the first space, or that under the licker-in, collects the dirt and short fibres of the material under operation, and the other two spaces collect the dirt and dust under the main drum and doffer.

HIBLING, H. *Improvements in waterproof boots and shoes.* Dated Nov. 22, 1855. (No. 2634.)

This invention consists in making that part of boots and shoes called the goloshe of a fabric of cloth, coated with india-rubber, or of thin sheet india-rubber; and in cementing this to the upper part of the boot or shoe, and also in cementing the sole thereto by a cement made of dissolved india-rubber.

KNOCKER, G. W. *Improvements in obtaining motive power.* Dated Nov. 22, 1855. (No. 2635.)

The design of these improvements is for producing a disturbance in the equilibrium of hydrostatic columns of water. 1. By employing three cylinders lying in the same horizontal plane, attached at one end to tanks containing water under high pressure, and fitted with pistons which work cranks set at an angle of 120° to each other, and which reciprocate with three others situated in an upper tier at an angle of 180° respectively, by which means a disturbance is always maintained, either positive or negative. 2. By fixing to the other end of the cylinders condensing chambers for the compression of air.

LOTTERI, F. *Obtaining fibre from the bark of trees of the morus family or class, and the application thereof to the manufacture of paper and textile materials, and for other useful purposes.* Dated Nov. 22, 1855. (No. 2636.)

This invention mainly consists in preparing a fibre or fibrous pulp from the bark of the wild mulberry-tree.

JOHNSON, J. H. *Improvements in apparatus for making ærated beverages.* (A communication.) Dated Nov. 22, 1855. (No. 2638.)

This invention consists of a vessel having a partition extending from top to bottom. A pouring lip is formed on each side of the vessel. In one compartment is placed the acid, and in the other the bicarbonate of soda, or other chemical preparations. Each compartment is then filled with water, and the powders allowed to dissolve. On pouring the liquid from the vessel the two solutions will commingle at the pouring lips as they enter the glass.

ROWLEY, J. J. *Improvements in machinery for cleaning and cutting turnips and other roots.* Dated Nov. 24, 1855. (No. 2650.)

This invention consists in arranging machines in such a manner, that the roots are screened before being cut. They are fed into a hopper, and there is a trough from which they pass into a rotating cylinder of wire work or otherwise, placed in an inclined position, through which the dirt falls while the root passes to the knife or cutter.

KNOWLES, R. *Improvements in winding on in certain machines for spinning cotton and other fibrous materials.* Dated Nov. 24, 1855. (No. 2651.)

These improvements relate to the winding on mechanism of self-acting mules and machines of the like nature, in which are comprised a radial arm and a winding-on band, with an intervening cord or chain attached thereto respectively. They consist—1. In a new method of making the rotary motion of the winding-on barrel while the carriage is running instrumental in moving the point of attachment of the cord or chain to the radial arm. 2. In making the changes in the position of such point of attachment produce their effects more promptly. The first is effected by fixing upon the axis of the said barrel, or upon some convenient part of the machine deriving rotary motion from the said barrel, a pulley, cog wheel, catch box, or other suitable agent, which by suitable connecting apparatus is made, as occasion may require, to act upon the contrivance which turns the screw of the radial arm, and thereby changes the position of the point of attachment of the winding-on cord or chain thereto. The second is effected by applying to the cord or chain of the winding-on

barrel an arrangement of fixed and moveable pulleys, so as to multiply the ordinary effect produced upon such cord or chain by changing the position of its point of attachment to the radial arm.

GREENWOOD, T. *An improvement in the construction of carding engines.* Dated Nov. 26, 1855. (No. 2660.)

The object of this invention is to attach the "bend pins" in such a manner to the bends or rings of the carding engine, that their positions may be changed with facility when required, without the necessity of making additional holes for the purpose. This object is effected by making a groove or slot in the bends or rings, so as to receive the foot of a bolt or pin, which is made wedge-shaped for the purpose, and may be moved to any part of the groove or slot, and secured there by nuts, washers, or otherwise.

CLERVILLE, J. J. C. DE. *Improvements in preparing oil with other matters for painting.* (A communication.) Dated Nov. 26, 1855. (No. 2663.)

Linseed oil is first boiled with peroxide of lead and sulphate of zinc; then a quantity of rosin and bee's-wax is dissolved therein; next a quantity of caustic alkaline solution is added—say about twice as much as there is oil—and the whole compound or mixture is boiled for a time, after which some essence of thyme is stirred in, and the whole is allowed to stand, and is afterwards filtered.

PROVISIONAL PROTECTIONS.

Dated May 28, 1856.

1277. Oldham Whittaker, of Hurst, near Ashton-under-Lyne, Lancaster, manufacturer, and Cyrus Wallwork, of the same place, manager. Improvements in weaving figured fabrics.

Dated June 4, 1856.

1324. Joseph Briggs, of Fleet-street, London, gentleman. Improvements in blocks and bricks for building.

Dated June 9, 1856.

1368. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the construction of rails for railways, and in the mode of securing the ends of rails for railways. A communication.

Dated June 18, 1856.

1440. Caleb Perry Sharpley, of Berry's Cottage, Chapel-street, Stockwell, Surrey. Improvements in paddle-wheels for propelling vessels.

Dated June 25, 1856.

1490. Henrich Ludwig Buff, of Fitzroy-square, Middlesex, and Frederic Versmann, of Forest-place, Kingsland-road, in the same county, chemists. An improvement in purifying and softening water.

1492. Alexander Keiller, of Dundee, Forfar, N. B., confectioner. Improvements in the manufacture of articles of confectionery.

1494. John Rohead, of Glasgow, Lanark, N. B., hat-manufacturer. Improvements in hats and other coverings for the head.

1496. Theoflo Scheller, painter, of Wasdenschweyl, Confederation of the Swiss. Certain improvements in obtaining and applying motive power.

1498. James Platt, of Oldham, Lancaster, machine-maker, and John Whitehead, of the same place, manager. Improvements in machinery or apparatus for making bricks.

1500. Louis Cornides, of Trafalgar-square, Charing-cross, Middlesex. Improvements in ornamenting metal, wood, leather, textile fabrics, and other substances.

Dated June 26, 1856.

1501. Gustave Durrich, of Stuttgart, in the kingdom of Wurtemberg. Improvements in gas-burners. A communication.

1502. John Gratrix, of Preston, Lancaster, and Alfred Knight, of Birmingham, Warwick, machinists. Improvements in apparatus for registering a permanent record of the speed of steam or other engines, which apparatus is also applicable to watchmen's registers, and other similar purposes.

1503. Henry Waller, of Lickhill, near Calne, Wilts. Improvements applicable to vessels used in the manufacture of cheese.

1505. David Macdonald, of Glasgow, Lanark, N. B., manufacturer. Improvements in printing textile fabrics and other surfaces.

1506. John Portus, of Morpeth, in the colony of New South Wales, engineer. Improvements in wheeled carriages.

1507. James Aikman, of Paisley, Renfrew, N. B., scourer. Improvements in the treatment, cleaning, or finishing of textile fabrics.

1508. François Joseph Lucien Malezieux, merchant, of Paris, French Empire. Certain improvements in the preparation of peat, and in the manufacture of the same into fuel, charcoal, and gas. A communication from Mr. Gautier.

1509. Joseph James Foot, of Spital-square, Middlesex. Improvements in weaving narrow fabrics. A communication.

1510. Basilio Scariano and Raphael Paul de Villamil, both of Rue Lepelletier, Paris, gentlemen. Improvements in apparatus for measuring and setting out the forms of garments.

1511. William Hudson, of Burnley, Lancaster, machinist, and Christopher Catlow, of Clithero, in the same county, overlooker. Certain improvements in looms for weaving.

Dated June 27, 1856.

1513. Andrew Shanks, engineer, Robert-street, Adelphi, Westminster. Certain improvements in machines for drilling, boring, and cutting metals.

1514. Charles Augustus Preller, of Lant-street, Southwark, leather-manufacturer. Improvements in unhairing and preparing skins, and in tanning. Partly a communication.

1515. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the production of carbonate of barytes. A communication from E. P. T. T. Montluc and L. J. Gauthier, of Paris, France.

1516. Donald Bethune, of Cambridge-terrace, Hyde-park, Middlesex, Esq. Certain improvements in apparatus for separating the more fluid particles from the more solid of various bodies.

1517. Edward Burnand, of Moudon Canton de Vaud, Switzerland. An improvement in the manufacture of fire-arms.

Dated June 28, 1856.

1518. George Henry Ormerod, of Newchurch, Whalley, Lancaster, manufacturer. Improvements in machinery for brushing and cleaning cotton fabrics.

1519. Edward Brown, of Henry-street Works, Sheffield, York, manufacturer. Improvements in

the casting of sailors' and other pocket-knife handles, and scales.

1520. George White, of Laurence Pountney-lane, Cannon-street, City. An improved poultice. A communication from Dr. Antelme, of France.

1521. Eugenio Vincenzi, of Turin, Piedmont, engineer. Improvements in Jacquard machines.

1522. Bevan George Sloper, of Kentish Town, Middlesex, gentleman. Improvements in freezing, refrigerating, and cooling, and in the machinery employed therein.

1523. Robert Reid, of Glasgow, Lanark, N. B., clerk. Improvements in the treatment or preparation of oils to be used for lubricating.

1524. Edwin Travis, of Oldham, Lancaster, engineer, and Joseph Louis Casartelli, of Manchester, Lancaster, optician. Certain improvements in machinery or apparatus for testing or ascertaining the lubricating quality of oils or other unctuous substances.

1525. William McAdam, of Glasgow, Lanark, manufacturer. Improvements in the manufacture of articles of clay and such like plastic substances. Partly a communication.

1526. Charles Armand Messager-Abit, of Rue de l'Echiquier, Paris, France. Certain improvements in the treatment of fibrous substances.

1527. Auguste Edouard Loradoux Bellford, of Bedford-street, Strand, London. Improvements in drying, burning, and cooling bricks, tiles, and other ceramic substances. A communication.

1528. Richard Orrell, of Low Moor, North Bierley, Bradford, York, engine tenter, John Cleminson, of Low Moor aforesaid, engineer, and William Barraclough, of Low Moor aforesaid, engineer. Improvements in steam boilers for preventing explosion thereof.

1529. Thomas Frederick Henley, of Bromley, Middlesex. An improved process for obtaining arrack or spirit from rice or other grain.

Dated June 30, 1856.

1530. Samuel Jabez Goode, of Aston, near Birmingham, Warwick, machinist. Improvements in gas stoves, and the application of the same to the ventilation of buildings.

1531. Ebenezer Rogers, of Abercarn, Monmouth, and Herbert Mackworth, of Clifton, Gloucester. Improvements in cooking, and in apparatus for that purpose. Partly a communication.

1532. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improved safety pocket for coats and other garments. A communication.

1533. Henry Brown, of Nelson-square, Nelson-street, Bermondsey, and Job Bartlett, Little Guildford-street, Southwark. The construction of an iron easy arm-chair bedstead.

1534. Cornelius Moriarty, of Nelson-street, Greenwich. Improvements in the construction of tube brushes used in cleaning the tubes of marine, locomotive, and all kinds of multitubular boilers.

Dated July 1, 1856.

1535. William Henry Ludford, of Fredworth, Gloucestershire, brush-maker. Improvements in the manufacture of brooms and brushes.

1536. Charles Woide Goodhart, of Woodlands, Middlesex, gentleman. Improvements in bars or gratings for the security of buildings and other property.

1537. Frederick George Sanders, of Poole, Dorset. Improvements in the manufacture of ornamental floor and other tiles, bricks, slabs, and other similar articles.

1538. Alfred Wild, of Windsor, Berks, tanner and currier. Improvements in the manufacture of boots and shoes.

1539. John Coope Haddan, of Cannon-row, Westminster, civil engineer. Improvements in the manufacture of projectiles, and in firing or discharging them from cannon.

1541. David Graham Hope, of Manchester, Lancaster, engineer, and William Andrew Fairbairn, of the same place, engineer. Certain improvements in steam engines.

1543. George Harvey and Alexander Harvey, junior, of Glasgow, Lanark, N. B., engineers. Improvements in machinery or apparatus for boring and drilling.

1545. George Tomlinson Bousfield, of Sussex-place, Loughborough-road, Surrey. Improvements in propelling and steering vessels when the force of water is used. A communication.

1547. John Hay, of Hay's Mill, Leith, and James Hay, of Edington Mills, Berwickshire. Improvements in the production of pearl barley.

Dated July 2, 1856.

1549. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the manufacture of cast steel. A communication from J. Jackson and Son, of St. Seurin, France, steel-manufacturers.

1551. Patrick Heyns, of Poplar, Middlesex, cooper. Improvements in axles, boxes, and wheels for carriages.

1553. William Frederick Spittle, of Birmingham, Warwick, machinist. An improvement or improvements in braiding or plaiting machinery.

1555. William Humber, of Dowgate-hill, London, engineer. Improvements in the permanent way of railways.

1557. Thomas Emmanuel Marais, of Ferrières la Verrerie, Orne, France. Improvements in railway signals.

1559. William Henry Hubbard, of Hemus-terrace, King's-road, Chelsea, Middlesex. Improvements in the manufacture of articles for lighting domestic and other fires.

1561. Alfred Vincent Newton, of Chancery-lane, mechanical draughtsman. Improvements in air engines. A communication.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

1571. Thomas Key, of Brick-lane, Bethnal-green. An improved knife cleaning machine. July 4, 1856.

1587. Alfred Louis Stanislas Chenot and Eugène Charles Adrien Chenot, of Clichy-la-Garenne, near Paris, France, chemists. A method of extracting eliminating extraneous substances from steel sponges. July 7, 1856.

1588. Alfred Louis Stanislas Chenot and Eugène Charles Adrien Chenot, of Clichy-la-Garenne, near Paris, France, chemists. Improvements in sorting ores or separating metals from each other, and from certain combinations with other substances. July 7, 1856.

1589. Alfred Louis Stanislas Chenot and Eugène Charles Adrien Chenot, of Clichy-la-Garenne, near Paris, France, chemists. Improvements in machinery for compressing metallic sponges and other substances. July 7, 1856.

1590. Alfred Louis Stanislas Chenot and Eugène Charles Adrien Chenot, of Clichy-la-Garenne, near Paris, France. Improvements in apparatus for the reduction of metallic oxides. July 7, 1856.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," July 15th,* 1856.)

556. W. Billinton. An improved method of treating wooden railway sleepers.

587. A. Tolhausen. Certain improvements applicable to bakers' ovens.

594. G. Spencer. Improvements in supporting the rails of railways.
602. W. B. Hayes. Certain improvements in looms for weaving.
605. T. W. Taylor. An improvement in flying or roving frames.
608. J. Sturge and A. Sturge. Improvements in rotary fluid meters.
615. P. Pimont. A certain process for restoring metallic spoiled pens.
625. E. T. Wright. An improvement or improvements in the manufacture of steam-engine boilers, iron ships and boats, and such other vessels and things as are or may be made by riveting together metal plates.
629. W. Oldham. Improvements in the manufacture of cement.
659. A. V. Newton. Improved means for separating substances of different specific gravities.
750. A. Trueman. Improvements in treating argentiferous regulus.
760. H. N. Penrice. Improvements in machinery for driving galleries through rock and other strata.
763. William Nimmo. Improvements in the manufacture of textile fabrics.
788. W. Roberts. Improvements in the construction of pumps.
852. P. Robertson. Improvements in power-loom weaving.
868. R. A. Brooman. Improvements in or connected with centrifugal machinery.
1026. W. Jones. Improvements in apparatus for regulating the pressure and flow of steam, water, and other fluids.
1083. C. W. Finzel, W. Needham, and J. Barton. Improvements in apparatus for filtering sugar and saccharine juices.
1149. J. Y. Simpson and W. Thomson. The manufacture or production of lubricating oil from a new material.
1226. R. Bell. An improvement in the manufacture or production of ornamental fabrics.
1241. F. P. Dimpfel. Improvements in the construction of screw-nuts for axle-boxes and other purposes.
1307. D. Avery. Improvements in the construction of bonnets and other coverings for the head.
1378. P. M. Parsons. Certain improvements in the permanent way of railways.
1405. W. Jacot. Improvements in fire-arms.
1410. H. G. de Châteauneuf. Improvements in apparatus for washing and bleaching clothes and other materials, to be called "the steam washing lixiviateur."
1449. C. P. Sharpley. Improvements in paddle-wheels for propelling vessels.
1472. J. Miller. Improvements in furnaces for more effectually consuming the smoke and economizing the fuel employed therein.
1474. G. Dyson. Improvements in the manufacture of iron.
1478. J. Taylor. An improved vessel for containing chemicals for the generation of disinfecting gases.
1490. H. L. Buff and F. Versmann. An improvement in purifying and softening water.
1492. A. Keiller. Improvements in the manufacture of articles of confectionery.
1500. L. Cornides. Improvements in ornamenting metal, wood, leather, textile fabrics, and other substances.
1506. J. Portus. Improvements in wheeled carriages.
1515. A. Shanks. Certain improvements in machines for drilling, boring, and cutting metals.
1527. A. E. L. Bellford. Improvements in drying, burning, and cooling bricks, tiles, and other ceramic substances.
1531. E. Rogers and H. Mackworth. Improvements in cooking, and in apparatus for that purpose.
1543. G. Harvey and A. Harvey. Improvements in machinery or apparatus for boring and drilling.
1545. G. T. Bousfield. Improvements in propelling and steering vessels when the force of water is used.
1561. A. V. Newton. Improvements in air engines.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEARS' STAMP DUTY HAS BEEN PAID.

1634. James Parkes and Samuel Hickling Parkes.
1635. Thomas Restell.
1650. George Dalton.
1651. Felix Lieven Bauwens.
1652. Joseph Bacon Finnemore.
1653. William Levesley.
1656. Andrew Burns.
1663. Thomas Hill Bakewell.
1666. Frederick Ransome.
1669. William Needham and James Kite.
1673. Richard Archibald Brooman.
1689. Henry Bessemer.
1692. Isaac Taylor.
1703. Samuel Colt.
1774. Griffith Jarrett.

LIST OF SEALED PATENTS.

1856. *Sealed July* 8, 1856.

255. John Gretton.
274. Francis Preston.
277. Peter Armand Lecomte de Fontainemoreau.
309. Thomas Hinchliffe.
329. James Meacock.
404. William Wilcocks Sleigh.
427. James Knowles.
611. Grand de Châteauneuf.
632. Joseph Pegg.
740. William Frederick Thomas.
833. Frederick George Underhay.
903. William Routledge.
953. William Maugham.
1067. Thomas Huckvale.
1096. Edward Daniel Johnson.
1108. James Wallace.
1109. Robert Wotherspoon.

1856. *Sealed July* 11, 1856.

89. Alexander Bain.
97. William Collett Homersham.
102. Austen Chambers and William Harrison Champion.
103. John Gottlieb Ulrich.
104. Anne Emilie Malteste.
107. Pierre Théophile Auguste Nicoulland.
112. Henry McEvoy.
133. Giuseppe Antonio Tremeschini.
236. Daniel Foxwell.
623. Louis Joseph Richard.

81. Charles Baptiste.
1078. Louis Fréderic Mayer.
1136. Jerome André Drieu.

1856. *Sealed July 15, 1856.*

113. Henry Law.
118. Johnson Thompson.
127. James Jackson.
132. William Westbrooke Squires.
151. Isaac Barnes.
159. James Pockson.
176. Alexandre Tolhausen.
181. Joseph Hopkinson.
183. Isaac Barnes.
196. Alexandre Tolhausen.
204. Alexander Dalgety.
250. Charles Frederick Claus.
279. Andrew Lamb and John Rolands.
345. John Wallace Duncan.
478. Robert Hawthorn and William Hawthorn.
514. Charles Alexandre de Fonbonne.
642. Thomas Bird and Thomas Rose.
1032. Stephen Carey.
1046. Samuel Rooke.
1162. William Henderson.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

J. Jones.—Yours is received with thanks.

F. F.—A full description of Professor Callan's "New Maynooth Single-fluid Battery," with some remarks upon it by a correspondent, and a reply by Professor Callan, were published at pages 249, 346, and 398 of of the 62nd volume of this Magazine, Nos. 1649, 1653, 1655, for March 17, April 14, and April 28, 1855.

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LONDON: Edited, Printed, and Published by Richard Archibald Broeman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1720.] SATURDAY, JULY 26, 1856. [PRICE 3D.

Edited by R. A. Brooman, 166, Fleet-street.

BOVILL'S PATENT MILLS FOR GRINDING GRAIN.

Fig. 4.

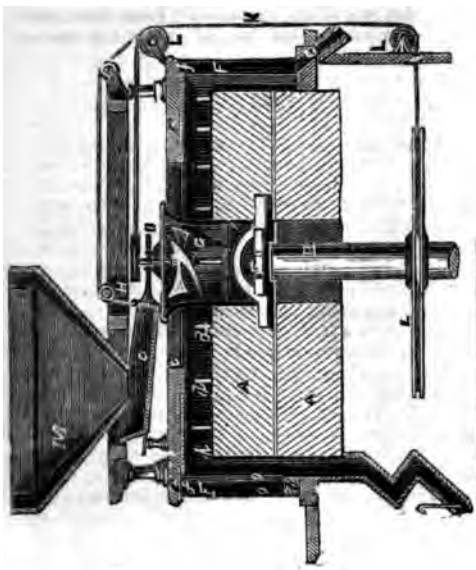


Fig. 5.

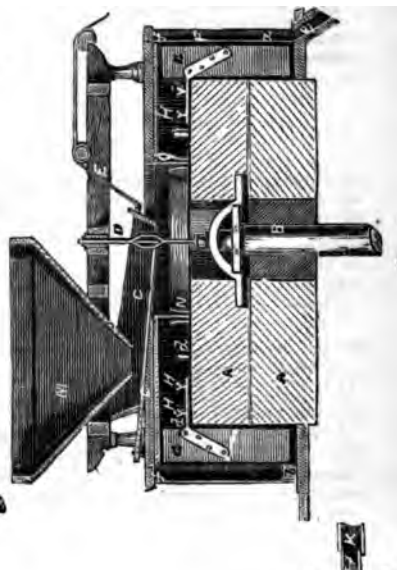


Fig. 1.

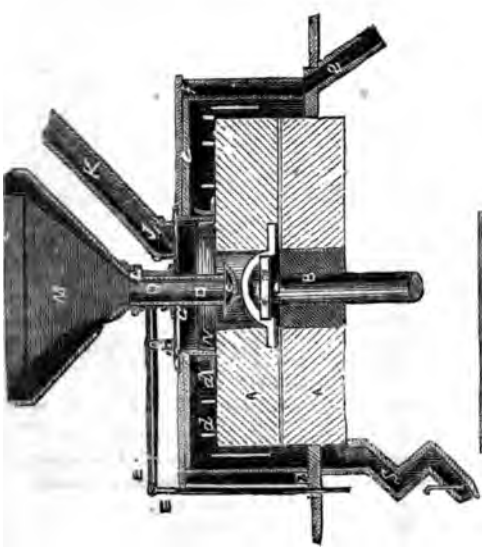
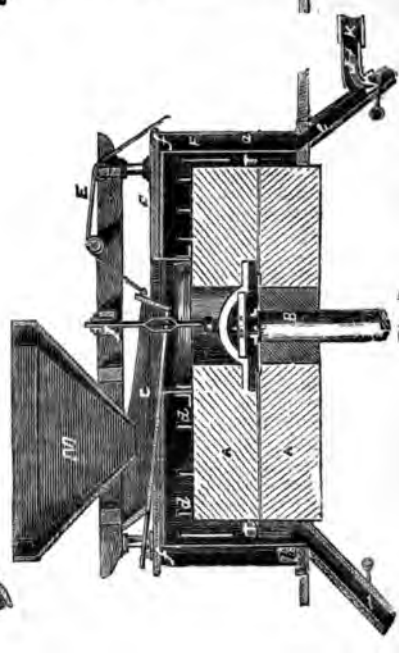


Fig. 7.



BOVILL'S PATENT MILLS FOR GRINDING GRAIN.

A VERY important action (Bovill *v.* Keyworth and another) has been prosecuted at the Court of Queen's Bench, Guildhall, during the present month, in connection with Bovill's patent for flour mills, and a decision arrived at which materially affects the interests of the proprietors of flour mills throughout the country. Mr. Knowles, Q.C., Mr. Bovill, Q.C., Mr. Webster, and Mr. George Denman appeared for the plaintiff; and the Attorney-General, Mr. Atherton, Q.C., and Mr. Hindmarch for the defendants.

The plaintiff in this action, George Hinton Bovill, was an engineer in Abchurch-lane, in the city; and he sued the defendants, Messrs. Keyworth and Co., millers at Lincoln, to recover damages for the infringement of a patent granted to the plaintiff, in June, 1849, for "Improvements in manufacturing wheat and other grain into meal and flour."

In order to bring the circumstances of the case fully before our readers, we propose, first, to describe Mr. Bovill's inventions patented 1846 and 1849.

The invention of 1846 consisted, firstly, in closing the eye of the running stone, by which currents of air above the pressure of the atmosphere may be introduced or forced between the stones, and in such a manner that the meal is delivered from between them in a cool state, and the operation of grinding is carried on more rapidly. Secondly, in the application of ventilating vanes or screws at the centre of the stones, for supplying the air between the grinding surfaces. Thirdly, in the application of blades to the peripheries of running stones for producing by a fan action the necessary current between the grinding surfaces. Fourthly, in the application of double stone hoops or cases for condensing and separating the dust or stive from the air, and avoiding the waste of meal.

Fig. 1 of the accompanying engravings represents a transverse section of a pair of mill-stones fitted according to one arrangement of the first part of the invention, in which A A are the stones as usually employed; B, driving spindle, on the cross bar, of which the cup, C, is attached to receive the grain from the feed pipe, D, which is regulated in the ordinary manner with the lever and regulating rod, E E; F, the double stone case or hoop, the top of which is closed by the cast-iron plate, G, fastened by bolts and nuts; attached to this plate is the nozzle, H, furnished with a throttle valve, J, for regulating the supply of air to the stones from the air pipe, K, through which the air is blown from an ordinary fan or other blowing machine; L, cast iron hollow column with open bars or flutes, between which the studs of the feeding lever are screwed to the feed pipe, D, which works through the column into the feeding hopper, M, which stands on the top of the column. N is a cast-iron grooved ring attached to the top of the running stone around the eye; O, a circular leather inserted into the groove of the cast-iron ring, and secured to the stone case, F, the object of which is to prevent the current of air or any grain passing otherwise than through between the grinding surfaces. It will be obvious when the stones are set to work, and a blast of air introduced from a blowing machine through the pipe, K, that there will be a considerable current of air between the stones from the centre outwards in every direction; and by the eye of the stone being closed up by the leather ring, O, and plate, G, the necessary pressure of the blast from the fan or other blowing machine is sustained, the blast of air not being able to get away through the eye of the stone; hence the blast will be equal to deliver in its passage from the centre of the stones outwards in every direction the meal or flour from the stones in a cool state, as it is produced from the grain; the stones are cooled, and being thus kept free from meal, their entire working surfaces are constantly in action on the grain, the stones thus performing a very considerably increased duty without a corresponding increase of power.

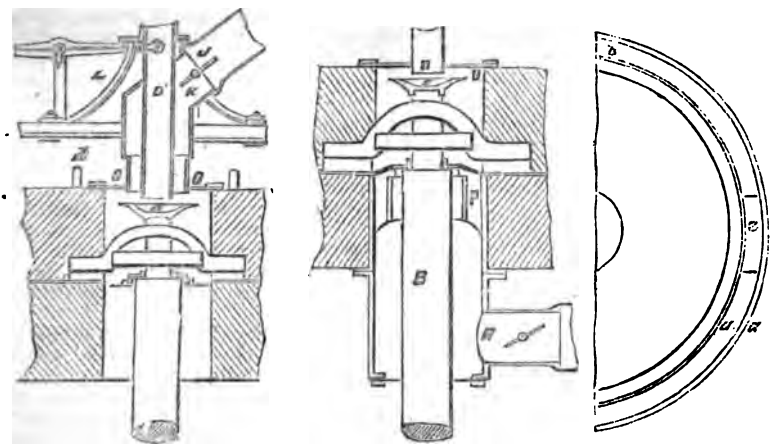
In his specification Mr. Bovill remarks that he is aware that air has before been introduced between the surfaces of mill-stones in various ways, but without closing the eye or centre of the runner, and therefore the supply of air passing between the stones has not been maintained above the pressure of the atmosphere; and such modes so heretofore practised have consisted of openings in the runner to create a circulation of air between the surfaces when working; also by the introduction of a blast of air through a pipe placed near the centre of the bed stone, such pipe being surmounted with a distributing plate attached to the driving spindle for dispersing the air between the surfaces; but from the necessity of the distributing plate being of much smaller diameter than the eye of the running stone to allow the feed of grain between the stones and the circumference of the distributing plate, the greater portion of the air blown into the eye passed up through the eye of the runner without effecting its object. And it has also been proposed to withdraw the air from the case containing the stones with a view to inducing air to pass down the eye of the runner and through between the stones. He would therefore have it understood that he does not claim as the invention the principle of causing air to pass between the grinding surfaces of mill-stones.

Fig. 2 is a transverse section, showing another arrangement of this part of the invention of 1846. The eye of the running stone is closed with the leather, O, secured to the top of the stone; this leather has a circular opening, into which the blast pipe, K, is fitted; there is a throttle-valve, J, for regulating the supply of air as in fig. 1, and the feed-tube, D, works through the air pipe into the feeding hopper, M, which is supported by the bracket, L. When the stones are working, the leather, O, attached to the runner works freely round the air pipe, K, the lower end of which is furnished with a telescope joint to facilitate it being withdrawn to clear any dust from the feed cup or eye of the stone, without stopping. By this arrangement of closing the eye of the running stone, the pressure of wind blown from the fan is sustained, as before described.

Fig. 3 represents another method of effecting the same purpose, the feed tube, D, being in this instance inserted into a circular opening to fit it in the leather covering, O, and the blast of air from the air pipe, K, introduced through an open cast-iron bush, P, around the spindle, B; the top of this open bush being covered with a perforated plate, Q, prevents the grain entering or choking the air pipe. R is a box or nozzle attached to the under side of the bush, having a throttle valve, as before, for regulating the supply of air; the bottom of the box, R, has a circular opening for the stone spindle to work through, but is to be so fitted as to prevent the escape of air.

Fig. 4 represents a transverse section of a pair of mill-stones fitted according to the second part of the invention of 1846. A A, mill-stones; B, driving spindle; C, feeding shoe of the ordinary construction supplied from the hopper, M; D, shaker or damsel for feeding shoe; and E, line for regulating feed in the ordinary way. F double stone case for preventing dust, as hereafter described; G, a portable ventilating blowing machine fitted to the eye of the running stone; this ventilator is furnished with blades or arms attached to a spindle, upon the top of which a small rigger, H, is fixed, for driving it at considerable velocity. The damsel, D, is constructed with a bush to carry the spindle of the ventilator. J, driving pulley on stone spindle from which the gut band, K, passes over

Fig. 2. Fig. 3. Fig. 6.



the small wheels, L L, round the small rigger of the ventilator. When the stones are set to work, this ventilator revolves at considerable velocity, blowing and sustaining a sharp blast of air down the centre of the runner, the blades performing the duty of supplying the necessary blast for discharging the meal from between the grinding surfaces instantly on its production; the grain passes freely down through the ventilator to the stones. The blades shown may be varied, or a screw substituted for them; the driving motion may also be altered at pleasure, and the ventilator be placed in the bed stone instead of the runner. Mr. Bovill remarks that he has found three blades, as shown on the ventilator spindle, and the arrangement for driving the same, the most convenient.

Fig. 5 represents a pair of mill-stones according to the third part of the invention, in which the arrangement of hopper, M, shoe, C, and damsel feeding apparatus, D, are of the common description adopted by most millers. Attached to the running stone, A, is a set

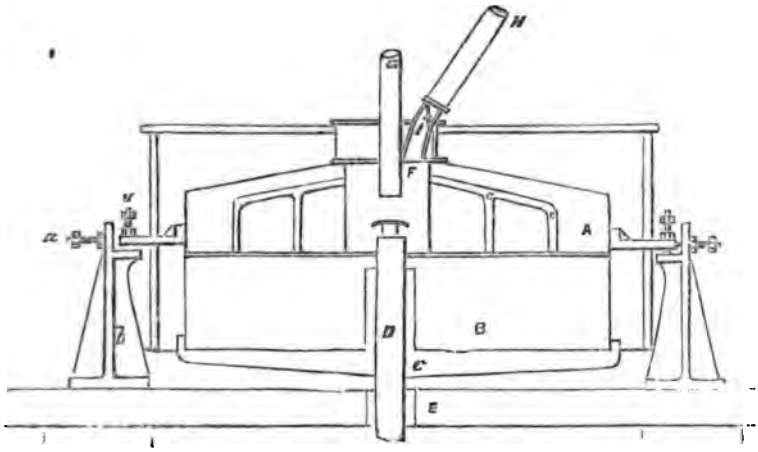
of fan blades, G G, secured to the stone by the thumb nuts, H H H H, so as to be easily removed. Fixed to the top of the runner, around the eye, there is a cast-iron grooved ring, N, into which the leather ring, O, is inserted, its other end being secured to the top of the double stone hoop, F; when the stone is set to work, the blades, G G, on its periphery, displace a large quantity of air, performing the functions of a fan; the air is blown through the slots, *dddd*, in the internal case of the stone hoop, F, and down the air-exit spout, the meal being delivered down the meal spout, S, in the ordinary manner; the leather ring, O, forming a joint in the groove of the cast iron ring, N, as it rotates with the runner, prevents any air or grain passing over the back of the stone; in proportion, therefore, to the displacement of air flying off from the outer circumference by the action of the fan blades, G G, so will the current of air be produced down the eye of the runner, between the grinding surfaces to the skirt, clearing the meal from the stones, as produced, and keeping the goods cool whilst undergoing the grinding process. "I am aware, as I have before remarked," says Mr. Bovill in his specification, "that currents of air have been produced by pumps or fans, exhausting the cases of mill-stones, which arrangement is most inconvenient, and such inconvenience is by this arrangement avoided. I mention this circumstance in order that the nature and extent of this part of the invention may be more clearly understood, which consists of connecting with the running stone fan blades to create currents of air between the grinding surfaces, by which the dust is avoided and the general arrangements of the old system are undisturbed."

The last part of the invention consists in the application of double hoops or stone cases to mill-stones for preventing the dust or stive produced in the process of grinding, by which great waste is avoided, and the inconvenience to the millers prevented. Fig. 6 is a plan (on a very reduced scale) of the double hoop marked F on the other fig. in transverse section. *a a*, rings or hoops of sheet iron, zinc, or other metal, fixed to the circular kerb, *b*, at the bottom, and to the cover, *c*; these hoops are placed about two inches apart; the internal one is perforated with a series of slots or openings, *d d*, cut down nearly to the joint of the runner and bed stone. By this simple arrangement the air surcharged with meal at the periphery of the stones is, by the centrifugal action of the running stone, impelled through the slots, *d d*, in the internal hoop against the outer hoop where the stive or fine dust carried with it sticks from its natural moisture; the current of air being thus broken, escapes free of any dust down the air-exit pipes, *e e*; by this arrangement, and by having the meal-delivery spouts made with angles, as shown in figs. 1, 2, and 4, at S, almost all dust is avoided, even when blowing or exhausting apparatus is applied. There are four small doors, *f f*, on the top of the double hoop, to enable the millers to sweep the stive or dust deposited between the internal and external hoops down the air-exit pipes, *e e*, into a sack or bin, and this operation will not be required more than once in twenty-four hours' work. Fig. 7 represents the application of this double hoop to stones when the current of air between the surfaces is produced by an exhausting air pump or fan; the suction pipe, K, provided with a throttle valve, J, for regulating the current, is attached to the air-exit pipe, *e*; the running stone has several scrapers, T T, for delivering the meal into the meal-delivery spout, S, which, as well as the air-exit spout, *e*, is furnished with a balance valve, V, to prevent the inlet of air, but allowing the meal to escape; by this arrangement the necessity of sucking the meal through the exhausting machine is avoided, and the waste and dust prevented.

The specification of the patent of 1849 was altered in May, 1855, by a disclaimer and memorandum of alterations, with the leave of the Attorney-General. We shall describe the invention from the amended specification. It relates, firstly, to an arrangement for ventilating the grinding surfaces of mill-stones, and the introduction of air through the top stone (when fixed) either by blowing or exhaustion. Secondly, in exhausting the air from the cases of mill-stones, combined with the application of a blast to the grinding surfaces. Thirdly, in separating the stive or dust of flour from the air, when exhaustion or blast is employed to facilitate grinding, and preventing the dust and waste in the mill. Fig. 8 is a transverse section of a pair of mill-stones, with the air-blast applied (as in the patent of 1846), showing the top stone, A, a fixture, and the bottom stone, B, hung firmly in a cast-iron dish, C, to the driving spindle, D, which works through a deep collar bearing in the cross-stay, E, fixed to the hurst. The spindle, with the bed-stone hung upon it, is raised or lowered in the ordinary manner. F, air-tight covering to eye of stone, through which the feed-tube, G, works. H, air-pipe from blowing machine, from which the supply of air is regulated by the valve, I. When the stones are set to work, it is first necessary to adjust the lower stone perfectly true and level, and then to lay the top stone down upon it face to face; the top one is then to be secured by the set screws, *a*, *a*, to the hurst brackets, *b*, *b*. The miller then lowers the bed-stone, as required for the operation *of grinding*. The grinding surfaces being perfectly true to each other, can never come in

contact when the bed-stone has been lowered in the slightest degree from the upper one; and the injury caused by the running-stone rolling upon the other, and destroying the

Fig 8.



grinding faces when short of feed on the old system is entirely avoided; the delivery of the meal from between the stones by the centrifugal action is much quicker; the corn and meal being upon the revolving stone are actuated outwards more rapidly than if rubbed outwards by the furrows of the top stone, as heretofore practised.

The first part of this invention of 1849 consists in introducing air pipes into the top mill-stone, so as to more freely ventilate the grinding surfaces when currents of air are forced or exhausted through them. In the top of stone, A, are placed the air pipes, *c, c,* which open into the furrows on the face of the stone, and are led away to the eye or back of the stone where the air is introduced. These pipes Mr. Bovill prefers to have of about one inch in diameter, and as many in number as the furrows in the stones, so as to give a free ventilation in addition to the supply of air down the master line from the eye of the stone. He says, "I am aware that large holes have been cut out in the running-stone and trumpet-mouthed pipes, introduced into the back of the running-stone with their ends terminating at the point of the master lines in the eye of the stone, to induce air, if possible, so as to pass between the stones; but it will be seen these differ essentially from this part of my invention, and have only been applied to the top stone when running; air has also been exhausted down through the eye of the top stone when running, and between the grinding surfaces. I do not therefore claim the principle except when worked in combination with a fixed upper stone."

In carrying out the second part of this invention of 1849, when working mill-stones with a blast of air, he introduces a pipe to the mill-stone case from a fan, or other exhausting machine, so as to carry off all the warm dusty air blown through between the stones to a chamber, as hereafter described, by which the dust in the mill is avoided, and the grinding improved. And this part of the invention relates only to sucking away the plenum of dusty air forced through the stones, and not to employing a sufficient exhausting power to induce a current of air between the mill-stones without a blast, this having before been practised, as above mentioned.

The third part of this invention of 1849 consists in straining the stive or air, which is surcharged with fine flour, through suitable porous fabrics, which retain the flour and allow the air to pass through; and this is accomplished by exhausting the air from the mill-stone case, or other closed chamber, receiving the meal from the stones by means of a fan or other exhausting machinery, and blow the stive so exhausted into a chamber, having its sides and top formed of one or more thicknesses of suitable porous fabrics, to allow the air under pressure to pass out deprived of the flour by means of this filtration. The same result is also obtained by placing the filtering chamber between the stone case or chamber receiving the meal and dust from the stones and the exhausting machine. The stive or dusty air is then sucked through the filtering fabrics instead of being blown through, and the air passing away clean as before.

Having thus described at length the inventions which form the subject of Mr. Bovill's patents, we now proceed to detail the proceedings of the action before referred to. The principal defence was, that the plaintiff's invention of 1849 was not new, it being nothing more than an addition to Gordon's patent, of 1844, of an exhausting apparatus which had been in use in connection with Gordon's patent before the year 1849. It appeared by the evidence that, in the old method of grinding corn, a considerable amount of heat was generated by the friction of the two mill-stones upon each other under a heavy pressure. The flour became heated and deteriorated, and it was also necessary to delay for some time the process of "dressing." The object, then, was to preserve the quality of the flour, and also to expedite the "dressing" process. This was effected by the plaintiff's patent of 1846, whereby a blast or current of cold air was made to pass between the stones. This blew out the flour and cooled it at the same time. The apparatus, however, had a great defect, for it greatly increased the quantity of the "stive," or light floating particles of flour, to such a degree that the health of the workmen suffered, and the invention was to a great extent deprived of its utility, though it was still used. But by the patent of 1849, the "stive" or floating dust was collected in a chamber and there sifted. The improvement thus introduced was at once appreciated, and adopted in several large establishments; and, according to the evidence, it was equal to an addition of 1*s.* to the value of every barrel of flour. The defendants, who were large millers at Lincoln, adopted the plaintiff's patent, and for several years they paid him 1,700*l.* a year for his licence to use it. But they had given notice to discontinue it, and had since used an apparatus made by a Mr. Gordon, which the plaintiff now contended was an infringement of his patent of 1849. It appeared that in the year 1844, two years before the plaintiff's first patent, Gordon had taken out a patent for introducing a blast of cold air between the mill-stones; and, according to the defendants' contention, they had done no more than use Gordon's patent, with the addition of an exhausting apparatus, which they contended was not the subject of a patent at all, it having been in common use at the end of the year 1848, more than a year before the plaintiff's specification was enrolled. The defendants called a Mr. Muir, of the Tradeston-mills, Glasgow, and he stated that in the year 1848 he had seen an exhausting apparatus in a mill at Altona, in Denmark, and that he immediately introduced it into the Tradeston-mills in the same year in conjunction with Gordon's apparatus. By the month of November, 1848, the apparatus, which was in principle the same as the plaintiff's, and identical with that made by Gordon for the defendants, was in full operation at the Tradeston-mills. According to the witness's statement, it was in common use there long before the plaintiff's patent, though it was afterwards discontinued. This was the first part of the defendants' case. The second was this:—The plaintiff had stated that he made the discovery which he patented in 1849 while endeavouring to cure the defect of his first apparatus, fitted up at the mills of Mr. Dives, at Wandsworth. This was denied by the defendants, who said the discovery was not made by the plaintiff, but by Mr. Dives's foreman. This was positively denied by the plaintiff, who said he made the discovery himself, and constructed and sent the apparatus to Mr. Dives, and that Mr. Dives had for several years since paid 2,000*l.* a year for the use of the plaintiff's patent. Even admitting that the plaintiff was an original inventor, it was contended for the defendants that the discovery had been previously made at Altona, and was in common use in the Tradeston-mills, Glasgow, before the plaintiff had taken out his patent, and therefore, however unfortunate it might be for the plaintiff, his patent could not be sustained.

On the second day of the trial (July 5) the Attorney-General summed up the defendants' evidence, and Mr. Knowles replied on the whole case.

Lord Campbell, in summing up the evidence, said there were three questions for the jury—first, whether the plaintiff was the original inventor; secondly, whether the invention was known and in use before the plaintiff's patent in 1849; and thirdly, whether there had been any infringement by the defendant. With respect to the first point, his Lordship thought the jury could hardly think the discovery was made by Mr. Dives's man, who was assisting the plaintiff in his experiments, especially as Mr. Dives had agreed to pay the plaintiff 2,000*l.* a year for the use of the patent. The main question would be whether the invention had been in common use in Mr. Muir's mill, at Glasgow, before the month of June, 1849, the date of the plaintiff's patent. If it was, the House of Lords had decided that use in Scotland was the same as in England, and as it was in successful use at Glasgow, the plaintiff's patent could not stand. But if it had been tried by Mr. Muir merely as an experiment, and had failed and been abandoned on that account, it would not affect the patent of another who brought the invention to a useful result. His Lordship then read two letters written by Mr. Muir to Mr. Gordon, dated February, 1849, and which referred to the system then in operation in the Tradeston-mills which Mr. Muir had become *acquainted with* at Altona. His Lordship observed that if Mr. Muir had brought the

invention into successful operation, as he stated he had done, it was somewhat strange that he should have abandoned its use, and still more that he should afterwards have negotiated with the plaintiff for a licence to use his patent. His Lordship then called the attention of the jury to the evidence to establish the infringement, and concluded by leaving those three questions to their consideration.

The jury retired to consider their verdict, and on their return into court they found for the plaintiff—Damages, 1,239*l.* 11*s.* 8*d.*

At the request of the defendants' counsel, two questions which arose on the construction of the plaintiff's specification were reserved for the consideration of the Court, and execution was accordingly stayed.

SIEMENS' REGENERATIVE STEAM ENGINE.

BY C. W. SIEMENS, ESQ., C.E.

(*Concluded from p. 57.*)

THE respirator, which was invented by the Rev. Mr. Stirling, of Dundee, in 1816, fulfilled its office with surprising rapidity and perfection, if it were made of suitable proportions. Its action was proved at the end of the lecture by a working model. It had been applied without success to hot-air engines by Stirling and Ericsson, but failed for want of proper application; for it had been assumed (in accordance with the material theory of heat) that it was capable of recovering all heat imparted to the air, and, in consequence, no sufficient provision of heating apparatus had been made. It having been found impossible to produce what, in effect, would have been a perpetual motion, the respirator had been discarded entirely, and was even now looked upon with great suspicion by engineers and men of science. Mr. Siemens had, however, no doubt that its real merits to recover heat that could not practically be converted by one single operation into mechanical effect, would be better appreciated. The rapidity with which the temperature of a volume of steam was raised from 250° to 650° Fahr. by means of a respirator, was indicated by the fact that he had obtained with his engines a velocity of 150 revolutions per minute. The single action of heating the steam occupied only a quarter the time of the entire revolution of the engine, and it followed that it was accomplished in one-tenth part of a second. But, in explanation of this phenomenon, it was contended that the transmitting of a given amount of heat from a hotter to a cooler body, was proportionate to the heating surface multiplied by the time occupied, and that the latter factor might be reduced *ad libitum*, by increasing the former proportionately. The air-engines of Stirling and Ericsson had failed also, because their heated cylinders had been rapidly destroyed by the fire; but the cause for this was, that an insufficient extent of heating surface had been provided; and it was well known that even a steam boiler would be rapidly destroyed under such circumstances. Mr. Siemens was led by his own experience to believe that his heating vessels would last certainly from three to five years, and being only a piece of rough casting, that could be replaced in a few hours, and at a cost below that of a slight boiler repair, he considered that he had practically solved the difficulty arising from high temperature. It was, however, important to add, that all the working parts of his engine were at the temperature of saturated steam, and therefore in the same condition as ordinary steam engines; whereas in Ericsson's engine, the hot air had entered the working cylinder. In surrounding the heating vessel with the boiler, an excessive accumulation of heat was prevented from taking place, and the pressure of the steam in the boiler became the true index to the engine-driver of the temperature of the heating vessel. Another essential property of the heating vessel was, that all its parts should be free to expand by heat without straining other parts, which was accomplished by a free suspension, and by undulating its surface. Lastly, it should be massive, to stand the fire with impunity; for iron was, strictly speaking, a combustible material. The pyropherus, or finely-divided metallic iron, took fire spontaneously on exposure to the atmosphere; a chip of iron was ignited in flying through the flame of a candle; an iron tea-kettle was destroyed by exposing it (unfilled with water) to a kitchen fire; whereas, in forging a crank-shaft, the solid mass of iron withstands the white heat of the forge-fire for several weeks without deteriorating. A heating vessel, properly constructed and protected, might be heated with safety to 700° Fahr., at which temperature it would be almost as able to resist pressure as at the ordinary temperature of the atmosphere, the point of maximum strength of iron being at 550° Fahr., as had been proved by experiments made for the Franklin Institution. The construction of a heating vessel com-

bining these desiderata was of paramount importance for the success of Mr. Siemens' engine, and had not been accomplished without combating against considerable practical difficulty.

Although heat may be entirely converted into mechanical effect, it would nevertheless be impossible to construct an engine capable of fulfilling this condition without causing at the same time a portion of heat to be transferred from a hotter to a cooler body, and which must ultimately be discharged. This necessity has been generally proved, and in a very elegant manner, by Professor Clausius, of Zurich, and implies at least the partial truth of "Carnot's theory." In the "regenerative steam engine," provision had been made for absorbing this quantity of heat, arising in this case from the circumstance that the saturated steam enters the respirator in a state of greatest density or compression, and returns through it (expanding into the regenerative cylinder) at a gradually diminishing density, although the temperature of the extreme edges of the respirator remains proportionate to the condensing point of the steam of greatest density, by providing water chambers about the cover of the working cylinder, and around the regenerative cylinder, which are in communication with the steam boiler. The heat absorbed from the slightly super-heated steam is thus rendered useful to generate fresh steam.

Objection had been raised by casual observers against the regenerative steam engine, on account of its apparent similarity in principle to the "air-engines" of Stirling and Ericsson, implying similar sources of failure. The apparent similarity in principle arose from the circumstance that both Stirling and Ericsson, as well as himself, had employed the respirator and high temperatures; but these were but subordinate means or appliances, that might be resorted to in carrying out a correct as well as an erroneous principle.

In winter 1852-53, when Ericsson was engaged upon his gigantic experiment in America, the speaker had had occasion to read a paper to the Institution of Civil Engineers, entitled, "On the Conversion of Heat into Mechanical Effect," wherein he had endeavoured to set forth the causes of probable failure of that experiment, and to guard against a sweeping condemnation on that account of some of the means Ericsson had employed.

According to the dynamic theory of heat, the elastic medium employed in a perfect caloric engine was a matter of indifference, and air had been resorted to because it was perfectly elastic, and always at hand. In practice, however, the elastic medium employed was a matter of very great importance, and he (Mr. Siemens) had given the decided preference to steam, and for the following reasons:—

1. The co-efficient of expansion of saturated steam by heat exceeded that of air in the proportion of about 3 : 2, but decreased with an increase of temperature. This was not in accordance with the established rule by Gay-Lussac and Dalton, but was the result of his own experiments (described in a paper, "on the expansion of steam, and the total heat of steam," communicated to the Institution of Mechanical Engineers, in 1850), and had been borne out by his practical experience on a large scale. Mr. Siemens had been first induced to undertake these experiments in consequence of an observation by Faraday, that the elastic force of the more permanent vapours gave way rapidly, when by abstraction of heat their points of condensation was nearly obtained. He conceived that gases and vapours would expand equally by heat, when compared, not indeed at the same temperature, but at temperatures equally removed from their points of condensation.

2. When saturated steam was compressed (within the regenerative cylinder), its temperature would not rise considerably (as the fire-syringe evinced in respect of air), because Regnault had proved that the total heat of steam increased with its density, and consequently the heat generated in compression was required by the denser steam to prevent its actual condensation. Without this fortunate circumstance, the steam would be heated already by compression to such an extent that it would be difficult indeed to double its elastic force by the further addition of heat in the respirator.

3. Steam exercised no chemical action upon the metal of the heating vessel and respirator, because the oxygen it contained was engaged by hydrogen, which latter had the stronger affinity for it until a white heat was reached; whereas the free oxygen of atmospheric air attacked iron and brass at much lower temperatures.

4. The specific gravity of steam was only about one-half that of atmospheric air at equal temperature and pressure; moreover, it was a far better conductor of heat, and both circumstances qualified it for rapid respirative action.

5. The fresh steam required for starting and sustaining the power of the engine was generated by heat that would otherwise be lost. No air-pumps, &c., were required, and the management of the engine became as simple as that of an ordinary high-pressure steam engine.

In conclusion, it was stated that at present there were several regenerative engines

in constant practical operation, in this country (at the works of Messrs. Newall and Co., at Gateshead), in France, and in Germany, varying from five to forty-horse power, which had proved the practicability of the principle involved, although they were still capable of improvement. Several other engines were now in course of construction at establishments celebrated for precision of execution, and with the advantage of Mr. Siemens' increased experience in designing them. He had been fortunate to meet with men of intelligence and enterprise, lately joined together in a public company, whose co-operation insured a more rapid development of his invention than individual effort could produce. The benefit he had hoped to derive from his discourse, incomplete as it necessarily was, would be realised, if those men, eminent in science, whom he saw around him, would accept his labours as an earnest towards the practical realization of the dynamical theory of heat, and hasten its triumphs by their own researches. It was impossible to over-estimate the benefits that mankind would derive from a motive force at one-third or one-fourth part the cost and incumbrance of the present steam engine. The total consumption of coal would certainly not diminish; but our powers of locomotion and production would be increased to an extent difficult to conceive, tending to relieve men from every kind of bodily toil, and hasten the advent of the hoped-for period of general enlightenment and comfort.

THE CHELMSFORD MEETING OF THE ROYAL AGRICULTURAL SOCIETY.

(*Concluded from page 55.*)

In fulfilment of the promise made in our last Number, we this week continue our notice of the Chelmsford Exhibition.

The patent combined clay-preparing and brick-making machine of Mr. H. Clayton, of the Atlas Works, London, deserves to be noticed with commendation. This machine may be worked either by steam or horse power, and is capable of producing from 20,000 to 30,000 bricks per day (according to size). It effects the pugging of the clay and the moulding and delivery of the bricks simultaneously, and is certainly one of the most efficient of existing machines of the kind.

The machine of Mr. Humphrey Chamberlain, of Kempsey, is also an excellent specimen of this kind of apparatus. The clay is fed into a pug mill, placed horizontally, which works and amalgamates it, and then forces it off through a mouth-piece or die of about 65 square inches, or about half an inch deeper and half an inch longer than is required for the brick, of a form similar to a brick on edge, but with corners well rounded off, each corner forming a quarter of a 3-inch circle; for clay will pass smoothly through an aperture thus formed, but not through a keen angle. After the clay has escaped from the mill, it is seized by four rollers, covered with a porous fabric (moleskin), driven at a like surface speed from connection with the pug mill.* These rollers are two horizontal and two vertical ones, having a space of 45 inches between them; they take this larger stream of rough clay, and press or roll it into a squared block of the exact size and shape of a brick edgeways, with beautiful sharp edges; for the clay has no friction, being drawn through by the rollers instead of forcing itself through, and is delivered in one unbroken stream. The rollers in this machine perform the functions of the die in one class of machinery, and of the mould in the other. They are, in fact, a die with rotating surfaces. By hanging a series of mandrills or cores between these rollers, or by merely changing the mouth-piece, hollow and perforated bricks are made without any alteration in the machine. The bottom roller carries an endless belt, on which the stream of clay is delivered to the cutting-frame. This carries a wire, which is constantly traversing at a compensating angle, while the clay is in motion, and thereby makes a square cut. After it has divided one brick, it changes its action and cuts off the succeeding one at the opposite angle to that which it had previously traversed. This wire is put in motion from gearing in connection with the rollers, which press the block of clay into the shape of a brick, and thereby act with mechanical correctness; for if the smallest portion of clay escapes from the mill, motion must be given to the rollers or rotating die by the driving-strap, and from them to the cutting wire.

In connection with this subject we may mention a model of brick-kiln, exhibited by Mr. Burrell, of Thetford. It consists of a long building, furnished on the lower floor with two channels side by side, one of which is the chimney of the furnace. Waggon loads of bricks are successively introduced at the far end of this chimney, and are gradually pushed up towards the part where the greatest heat acts, becoming ultimately red

* The feeding these rollers with a stream of clay by means of the die falls within the claims of Mr. Clayton's patent. Mr. Chamberlain has, therefore, made arrangements with that gentleman for the use of that part.

hot, and then passing slowly out through the other channel, in which they cool. Drying sheds are constructed over the two channels, and the heat delivered by the cooling of the bricks, being conducted into these sheds, is employed to effect a preliminary drying of the bricks.

Leplay's patent distillatory apparatus for extracting pure spirits from beetroot, a model of which was exhibited by W. Dray and Co., of Swan-lane, the patentee's agents in this country, is a very important invention. Its object is to treat beetroot in such manner as to extract alcohol therefrom, and render the remaining parts of the vegetable fit and nutritious food for cattle, the alcohol obtained being a marketable product, and the food possessing the most advantageous properties for the purpose for which it is intended. The invention consists in causing the sugar to ferment in the cells of the beetroot, and in distilling the substance by direct distillation. The vegetable substances retain all their nutritive portions, the sugar only being removed by fermentation and distillation. The beetroot is first cut up into pieces or strips of such shape as that, when piled one on the other, spaces may be left between them for the circulation of steam. The pieces are then immersed in fermented juice or liquid, and a certain proportion of sulphuric, hydrochloric, nitric, oxalic, tartaric, or other powerful acid, is added. The fermentation which ensues changes the sugar of the vegetable into alcohol, which is next distilled out by means of apparatus, in which the distillation is carried on as follows:—The pieces of vegetable are placed in layers, one above the other, on perforated diaphragms in a vessel into which a current of steam is introduced. The steam circulates between and among the pieces, heats them through, and expels the alcohol therefrom, which ascends among the layers of vegetable in a state of vapour, gathering strength as it rises. A number of vessels, containing layers of vegetable, may be placed one over the other, and the vapour allowed to pass up through them to increase its strength. The alcoholic vapours pass away through a refrigerating coil or vessel, leaving the vegetable substances cooked, and in a state of pulp, ready to be employed as food for cattle. After this process the pieces of fermented vegetable substances retain their form, and are left to drain or discharge their moisture, &c., whereby they are reduced in bulk, but the nutritive matter contained in them becomes concentrated, so that hardly any of it is lost. The pieces may be piled up in thick layers in a drained or porous field or ditch in the open air, where they form a compact mass, which may be preserved for a length of time without the addition of any preserving ingredient, and even without being covered over with earth. Placed in an open tank they keep perfectly fresh for more than twelve months; they are almost as nutritive as beet boiled without being distilled. Farmers may set up a small apparatus at a most trifling expense, particularly if they have a portable farming engine. Mr. Leplay distilled last season, from October 1855 to April 1856, 9,000 tons of beetroot. The residues or cooked and distilled slices sell at 10*s.* per ton, and Mr. Wm. Dray is now feeding sheep with them. The results of his experiments will be published. We witnessed some very satisfactory and conclusive experiments with the model at Chelmsford. Every ton of beet produces, when distilled by Mr. Leplay's system, nineteen gallons of proof spirit.

From the circular of the agents we learn that a book will be published in a few days containing, 1st—a description of the process of distillation. 2nd—On the cultivation of sugar beet. 3rd—The great advantage this culture promises to the farmer, with letters from some of the largest agriculturists in France, showing the advantage of feeding cattle with the residues. The apparatus deserves the best attention of economical agriculturists.

Mr. Fisher, of Oundle, exhibits an improved horse-rake, of admirable design and very efficient in action, the invention of Mr. N. Smith, of Thrapstone. It is constructed as follows:—A frame is formed of two levers as beams, which run from side to side of the implement, and of two sides with arms projecting towards the front. The shafts are connected to branch irons, which are secured to the crossbars of the frame. The rakes are mounted loosely on an axis, which extends from one of the side arms of the frame to the other, and is also supported by being passed through two of the branch irons to which the shafts are attached. To this axis are connected four or more arms or levers which project backward, and carry a rod or bar, which extends across the machine, and on which the beams or shanks of the rakes rest; and by means of a lever, (which is ingeniously arranged so that it may be worked by an attendant either at the front or the back of the implement, as desired,) the rakes are raised on this rod as often as may be required, without the horse being stopped, or the progress of the implement interfered with. The beams or handles of the rakes are formed of tubular iron, and the tines or teeth of steel.

Mr. Hayes, of Elton, Oundle, exhibits an apparatus for raising straw. It takes the straw off the end of the shaker when working with the threshing machine, and carries

it up to the top of the stack. It is formed of two octagonal drums 20 inches in diameter, on which is worked by suitable machinery a chain carrying tines. The apparatus is characterized by the smallness of the power required to work it, as well as of the wear and tear incidental to its use.

Mr. Burrel, of Thetford, exhibits a corn sieve worth notice, attached to his threshing machine. It consists of sloping riddle to which a reciprocating motion is imparted. The wires, which are parallel, are kept clean by means of series of fixed buttons or discs protruding between them. The grains of wheat rise over these in their downward passage.

It is right to remark, before closing this article, that the arrangements at Chelmsford were extremely well made and carried out by the officers of the Society. One feature, in particular, deserves especial commendation—that of providing change (without deductions) for the convenience of visitors, near the spot where payments are made. If this example were imitated wherever exact payments, and such only are received, it would frequently avoid great public inconvenience.

PENN'S WOOD BEARINGS.

In our Number for April 14th, 1855, we gave a description of the wood bearings for machinery, recently introduced by Mr. Penn, of Greenwich. Since that time the application of such bearings has been greatly extended, and a paper on the subject, prepared by Mr. Penn, has been read at the Institution of Mechanical Engineers, Birmingham. The following article comprises the principal portions of that paper:—

In the bearings of the shafts of screw propellers a considerable difficulty has been experienced, when the screw has not been kept in regular work, but has been required to stand still for several hours or even days together, as is more particularly the case with war steamers. In such cases it has been found requisite, in timber vessels having copper sheathing, to protect the wrought-iron screw shaft by a brass casing, wherever exposed to the action of the sea water; since otherwise the galvanic action excited by the copper causes a serious and rapid corrosion of the iron shaft, and its bearings soon become injured. A similar action takes place also in iron vessels, but not to the same extent. The shaft is consequently cased throughout with a brass tube, which fits close to the shaft at the journals, and is loose from it between them. But the friction and wear at the bearings is in this construction very great, as the brass casing of the journals has to turn in brass bushes; and the result is a very rapid wear, and a great difficulty in keeping the bearings long at work. Moreover, the screw propeller itself is a heavy mass, weighing in some cases from 10 to 12 tons, coupled at the end of the shaft by a cross T head, for the purpose of easily unshipping and raising it out of the water by means of the lifting bearings when it is not required for steaming. The wear of the brass bush is very uncertain and various, and has been found to amount to as much as an inch in thickness in the course of a few months.

The author of the paper, having had his attention forcibly called to the subject by these circumstances, made a series of experiments on different materials as bearing surfaces, and the final result has been the adoption of wood bearings for the screw shafts, and these have now come into general use for this particular application with complete success.

The method in which the wood is employed was then shown (see *Mech. Mag.*, vol. lxii., p. 342, No. 1653). The ordinary brass bush has longitudinal dovetailed grooves formed on its face, which are filled with strips of hard wood; lignum vitæ has been generally used. The strips of wood are about 2½ inches wide, with a space of about three-quarters of an inch between each, and stand out one-fourth of an inch from the surface of the brass; water is kept constantly flowing between the strips along the shaft, and forms the only mode of lubrication, and this is found to prevent all tendency to heating or wearing of the journals.

Besides a large number of merchant vessels, upwards of 200 of the last new ships constructed for H. M. service have been fitted with wood bearings, and all former vessels are being altered to the same plan as fast as opportunities will permit. As far as present experience has gone, neither the wood nor the journals appear to suffer any appreciable amount of wear or deterioration after many months' continued exposure to the action of the water.

The *Himalaya*, of 3,500 tons, and 700 horse-power, furnishes perhaps the best practical proof that can be adduced of the durability of the wood bearings. This ship was fitted in the first instance with the usual metallic bearings, but the wear was of so serious a nature as to induce the proprietors of the vessel to adopt the improved plan almost immediately after the author's discovery of its utility. The *Himalaya* being

shortly afterwards purchased by the Government, was employed as a transport, and during the first 10 months of her service she steamed 20,000 miles without exhibiting the slightest signs of wear in those parts which had previously given so much trouble. The screw of the *Himalaya* weighs upwards of 11 tons, and is not fitted with the means of raising it out of the water; and consequently, having no after bearing, the whole weight, in addition to the projecting portion of the shaft, is carried by the stern bush alone.

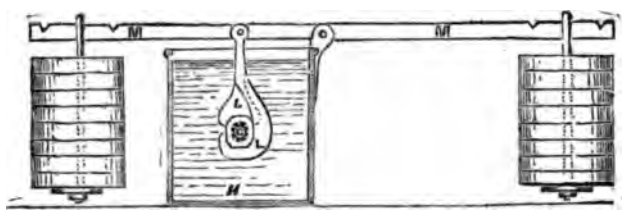
H. M. steam sloop *Malacca*, of 200 horse-power, also furnishes good evidence of the advantages of wood over brass and other metallic bearings.

The ordinary brass bearings of screw shafts are made very long in proportion to their diameter, so that the pressure on them is only about 60 lbs. per square inch when the journals are in contact throughout; but this pressure is considerably increased in practice, owing to the bearing being sometimes thrown out of line by the straining of the vessel.

In the wood bearings, the surface is reduced more than one-fourth by the spaces left between the strips of wood; but it appears from the results of working that one-tenth of the area of bearing surface is sufficient with wood as compared with brass. The wood bearings are found to stand a working pressure as great as 2,000 lbs. per square inch; and in some experiments made to ascertain the point at which abrasion would commence, a pressure of 8,000 lbs. per square inch was sustained without producing abrasion; whereas brass on an iron bearing at a pressure of 200 lbs. per square inch was found to cut directly, whether lubricated with oil or water, and failed quickly by the rapid cutting or abrasion.

The experiments which led the author to the adoption of the wood bearings were made with the apparatus shown in figs. 1

Fig. 1.



and 2, consisting of a wrought iron axle, G, 1½ inch diameter, running in wooden bearings at each end of a trough of water, H, 2 feet long. The axle was immersed wholly in the water, and driven by a pulley, J, on the outer end, at a speed of 700 revolutions per minute, representing a velocity of 260 feet per minute at the circumference of the axle, which corresponds with or rather exceeds the ordinary velocity of the journals of screw shafts. One-half of the length of the axle, K, was covered with brass, the object of which was to try alternately the effect on brass and iron under precisely the same circumstances. A cylindrical bearing, 1½ inches diameter and 2 inches long, was turned on the centre of each portion of the axle, upon which were placed the experimental bearings of which the relative frictions were to be ascertained; and in order to prevent any source of error from friction in the fixed bearings at the extremities of the axle, two experimental bearings, L L, were used at the same time, placed close together side by side, one above and the other below the axle, and pressed against the journal in opposite directions by two weighted levers, M M, having adjustable weights to regulate the pressure. By this arrangement the axle was, as it were, suspended freely in the trough of water, having no material friction in the fixed bearings at the extremities.

The relative friction of the different materials under trial was measured by the rise of the temperature of the water in the trough in a given time, caused by the rotation of the axle, the quantity of water being exactly 2 cubic feet in each case, and at the same initial temperature. In estimating the pressure to which the bearings were subjected, 1 square inch of bearing surface was used, and the total weight on each bearing gave the pressure in lbs. per square inch.

The particulars of the experiments are given in the Table appended, and the general results obtained were as follows:

Description of Bearing.	Pressure per square inch.	Time of Running.	Result of Experiment.
	lbs.		
Brass on Iron	448	30 mins.	Little or no cutting.
Brass on Iron	675	1 hour	Cut and abraded.
Brass on Iron	4480		Seized and stuck fast immediately.
Lignum Vitæ on Iron	1250	36 hours	No signs of wear: original slight scratch not worn out.
Box on Brass	4480	5 mins.	Not cut.
Lignum Vitæ on Brass	4000	5 mins.	No injury. This specimen is shown full size in fig. 3.
Snake-wood on Brass	4000	5 mins.	No injury. Shown full size in fig. 3.
Cam-wood on Brass	8000	5 mins.	No injury. Shown full size in fig. 4.

Fig. 2.

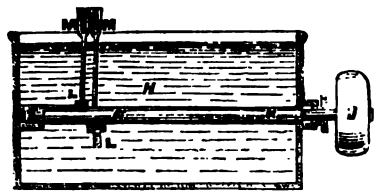


Fig. 3.

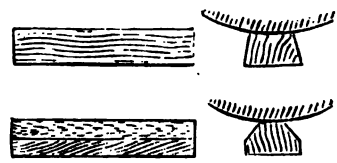


Fig. 4.

In the foregoing experiments, the principal object was the prevention of the serious evils attending the ordinary bearings of screw shafts; and the circumstances under which the experiments were conducted were therefore arranged to correspond as nearly as possible with those experienced in the actual working of ordinary screw shafts; the experimental axle was wholly immersed in salt water, and was driven in all cases at a speed equivalent to that of screw shafts on the largest scale.

The result obtained from these experiments was so definite and satisfactory that arrangements were immediately made for the application of the wood bearings to the screw shafts of H. M. ships, and these have in every instance succeeded beyond expectation.

The general results at present appear to point to the use of a plentiful supply of water, to carry off the heat caused by the friction of the bearings; and in the cases where this can be accomplished thoroughly, so as to carry off the heat as fast as it is generated, a brass journal revolving in hard wood bearings is practically perfect, showing no perceptible wear under a much more severe pressure than is usually met with in machinery. The two rubbing surfaces appear in reality to run without any lubricating material between them, and the water acts merely as a conductor to carry off the heat as rapidly as it is produced.

One other application of the wood bearings may be mentioned, which has been practically tried, and found very advantageous. The bearing which receives the thrust or propelling effect of the screw in the direction of the vessel's motion is formed of a series of collars on the shaft, running in corresponding grooves in the brasses, which have been found to wear very seriously, in a similar manner to the main bearings of the screw shafts. The thrust bearing of the *Himalaya* had the brasses worn away longitudinally nearly ¾ inch at each collar, and this was repaired by the engineer whilst out on the voyage, by putting in a set of rings of lignum vitæ as an experiment, filling up the worn space. The wood was merely sawn into half rings, the lower pieces being slipped in from above without lifting the shaft from its bearing. This plan answered completely, and no perceptible wear was found in the wood rings

after the voyage home, the original saw marks not even being effaced; and the bearing proved so satisfactory, although only temporarily constructed, that the vessel has gone to sea again without any alteration. In this case the wood bearing was allowed to work most of the time with oil alone as a lubricating material.

Of the various kinds of wood that have been tried in the experiments, lignum vitæ appears to be very satisfactory, and nearly as good as any, and it has the practical advantage of being less expensive, and readily obtainable.

After the reading of the paper, Mr. F. P. Smith stated that, in the unavoidable absence of Mr. Penn, from illness, he had attended the meeting in his stead, and would be able to give any further explanation that might be desired upon the subject, as the experiments upon the wood bearings had been conducted under his own superintendence. He exhibited a number of specimens of bearings that had been experimented upon, consisting of different kinds of wood, and also of ivory, brass, and white metal.

The Chairman (Mr. W. Fairbairn) observed that he hoped the subject would not be allowed to rest with the application of wood to the bearings of screw shafts alone, but that experiments would be made with a view to the use of wood for other purposes, such as perhaps the journals of locomotives and railway carriages, and other bearings in machinery exposed to much wear, and requiring at present much repair.

Mr. Smith said it was the intention of Mr. Penn at the earliest opportunity to try a second series of experiments, in a more complete manner, carrying them out if possible to the limits in each case of the material tested. The test to which the wood bearings had been subjected in the "Himalaya" was the severest to which it was possible that they could be exposed in practice.

Mr. James Brown inquired whether the wood bearings had been applied to any rubbing surfaces, such as cross-bar guides, in which the wear was caused by a reciprocating motion; and also whether any trial had been made of them for main shaft bearings.

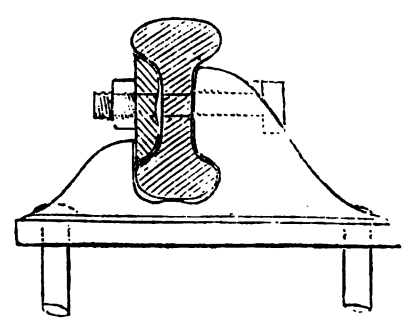
Mr. Smith replied that they had not yet been tried for a reciprocating motion, but had been applied to the bearings of a crank shaft driving the machinery in Mr. Penn's factory; in this application, however, the wood had not proved superior to brass, and was attended with some inconvenience, as special provision was required to insure a liberal supply of water to the bearings; otherwise the wood was speedily charred, and became useless. It had also been tried for the crank pin of the *Malacca*, but was not found better than other bearings, such as soft metal; in such situations there was no means of maintaining the wood in a water bath to keep down the temperature, which appeared to be essential in the use of wood for bearings.

The Chairman observed that the complete immersion of the whole bearing in water appeared to be an essential element in the successful application of wood, and he suggested that in future experiments a thermometer should be applied direct to the wood or metal bearing under trial, in order to ascertain the exact temperature, as it was evident that this would be somewhat higher than that of the surrounding water. The same experiments might be made very serviceable to determine the relative friction of the various kinds of wood and metal tested. He inquired whether wood had been tried in different positions of the fibre, endways as well as lengthways of the grain.

Mr. Smith replied that it had been tried in all three positions—endways, in the direction of the fibre, and transversely to the fibre; but the experiments had not been continued long enough to test their relative value. He was inclined to think the end way of the grain was the best mode of applying wood.

JONES'S RAILWAY CHAIRS.

Mr. J. Jones, of Warrington, on the 5th of April last, obtained provisional protection for certain improvements in railway chairs, and a method of securing the rails to the same. The improvement is chiefly applicable to joint chairs, but may be adopted with advantage to single chairs as well. The inventor raises the bed of the chair a little in the centre, as shown in the cut, so that



the centre of the rail only bears upon the said raised part, thus forming a partial bed-

ding instead of a solid one, as is now generally adopted. In consequence of the use of this partial bedding, when the rail is turned upside down, there will be no shoulder left upon it, as in the former case.

In jointed chairs he passes two screw-bolts through the side of the chair and the rails, so that one bolt passes through near the end of one rail and the other near the end of the other, thus keeping the joint perfectly tight, and preventing the ends of the rails rising or lifting from the chair.

For the purpose of tightening or wedging the rails in the chair, a wedge or fish is introduced when necessary, or a shoulder is formed on one side of the chair, so that it can be screwed up with the rails, and a perfectly tight joint formed.

Mr. Jones has furnished us with the following memoranda relating to his improved chair:—

The weight of cast iron in one chair	35 lbs.
The weight of wrought-iron plate or fish	3 lbs.
The weight of wrought-iron two bolts and nuts . .	2 lbs.
Total weight when complete	40 lbs.

CARTRIDGES FOR RIFLES.

To the Editor of the Mechanics' Magazine.

SIR,—A knowledge of the following fact may be interesting to some of your numerous readers. When making experiments recently with a strong, heavy, short rifle, of about an inch bore, from some defect where the bottom of the nipple communicates with the interior of the breech, the grains of gunpowder did not rise to the top of the nipple by the action of ramming the wad home; in consequence, the fire of a military percussion cap frequently failed to fire the charge. But when I made my *seamless* cartridge, with a little fulminating mercury placed within it at the end opposite to the shot, and nearest to the bottom of the nipple when in the barrel, the fire of the percussion cap never failed to fire the cartridge, although the paper of the cartridge was not pierced by any means. A cartridge constructed after this manner is well adapted for breech-loading arms, as it can easily be withdrawn at any time without being the least injured, as no grain of the gunpowder can come in contact with the interior of the barrel.

I am, Sir, yours, &c.,
J. NORTON.

Rosherville, July 19, 1856.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

CLARK, J. *Improvements in the chain-wheels used on capstans, windlasses, and other axes.* Dated Nov. 26, 1855. (No. 2664.)

Each wheel consists of two flanches, between which, towards the axis of motion, is a groove suitable for receiving the largest thickness of metal of which a chain (to be worked by the wheel) is composed. Beyond the outer circumference of this groove there are radial projections, and it is the manner in which these radial projections are connected together that constitutes the peculiarity of this invention. Their outer ends on each plate or flanch are at such a distance apart as to receive between them the longest link, and each two neighbouring ones are connected by a bearing surface composed of a compound curve, that is concave on a radius from the centre of the wheel to the periphery, and concave between the two neighbouring projections.

BELL, R. *Improvements in the manufacture of woven fabrics when made of wool and cotton, or of wool, cotton, and silk.* Dated Nov. 26, 1855. (No. 2665.)

This invention relates to fabrics, each consisting of two or more warps, and of three or more wefts. The patentee uses in some cases three distinct warps of cotton, and two distinct wefts of wool, the third warp not being worked into either surface, but placed in the centre between the two; or when using only two warps of cotton and two wefts of wool as above, he uses a weft of cotton not worked into either surface, but placed in the centre; or he uses three or more warps of cotton, two of these warps being wefted with wool as above, one on each side of the cloth, and the other warp or warps wefted with cotton in the centre between the two outer folds, and all woven together into one cloth.

ALLAN, T. *Improvements in applying electricity.* Dated Nov. 27, 1855. (No. 2666.)

This invention consists in the application of electricity by the employment of a relay and two separate circuits to produce signals to the eye and ear simultaneously. One particular application of it is communicating between guard and engine-driver upon a railway train as follows:—Mr. Allan places on the engine a relay, local battery, gong or bell, and indicator, with one line of communication through the train to the guard's van (the circuit being completed by the earth). In the guard's van he places a contact-maker to put the relay on the engine into action. The relay (by means of the local circuit or battery) will set in action

the bell and indicator, and so draw attention, and give the required signals. The relay most suitable for such purposes is one formed of a many-poled magnet.

NEWTON, W. E. *Improvements in breech-loading fire-arms.* (A communication.) Dated Nov. 27, 1855. (No. 2667.)

The first improvement consists in hanging the barrel at some point between its two ends on a sliding and turning joint, and connecting it by a joint link with a lever below, jointed in turn to the stock or lock frame, so that by moving the said lever downward and forward, the barrel shall be first pushed forward to open the breech, and then elevated to bring the open end thereof above the fixed breech, for the insertion of the charge, and then, by moving the said lever back, the rear end of the barrel shall be depressed, and then drawn back against the fixed breech. The next improvement consists in combining with a sliding barrel made with the rear or breech end open a fixed breech pin, which fits the bore of the rear end of the barrel, in combination with an annular recess surrounding the said pin, to receive the rounded edge of the rear end of the barrel, to prevent the escape of gases, and in case of any escape to deflect them towards the muzzle.

HYDE, H. *An improved manufacture of lubricating compound.* (A communication.) Dated Nov. 27, 1855. (No. 2668.)

To every 100 gallons of coup oil 7 lbs. of elastic bitumen para, or East India caoutchouc, or African-rubber, are added, the same being first enclosed in a sieve cloth bag, and then suspended in the oil, which may be at any temperature varying from 80° to 150° Fahr. By agitating the whole from time to time, and applying pressure to the sieve cloth, all the pure part of the added hydrocarbon is dissolved and combined with the oil. The bag is then removed, and the mixture is passed, by means of a pump, through a fine wire gauze sieve into another vessel, where it rests until it becomes perfectly brilliant, and is then fit for use.

HYDE, H. *An improved manufacture of lubricating oil.* (A communication.) Dated Nov. 27, 1855. (No. 2669.)

Castor oil of good quality is selected, cooled, and pressed at 30° Fahr. to remove excess of stearine; the oil is then melted and washed by steam 212° Fahr., and afterwards rendered dry by a tin steam pipe in a lined copper vessel, retaining the heat at about 100° Fahr. Coup oil, as manufactured by the process described in the specification of Ross's patent, is added in equal bulk, and well mixed with the warm castor oil. An equal bulk, more or less, of the light hydrocarbon oil obtained from bituminous substances, and manufactured under the patentee's patent, dated Nov. 24, 1855, is added, and after being intimately mixed by means of a jet of steam, the whole is allowed to cool. The mixture is next transferred to pans, and exposed to sunlight and gentle heat for a week or two, until it becomes clear, after which it is fit for use.

TAYLER, F. *Improvements in paddle-wheels for propelling vessels in water.* Dated Nov. 27, 1855. (No. 2670.)

The patentee claims the arrangement of certain wheels and floats, to work with a rim or ring and friction rollers.

RICE, C. *A new or improved method of manufacturing boots or shoes.* (A communication.) Dated Nov. 27, 1855. (No. 2671.)

This invention consists in uniting the insole upper (made wholly or in part of india-rubber), and outsole of boots and shoes, by means of india-rubber or other analogous cement passing through perforations in the upper.

PEYTON, E., and D. MORRISON. *Improvements in the construction of metallic bedsteads and other articles to sit or recline upon.* Dated Nov. 27, 1855. (No. 2672.)

This invention consists in employing castings of brass for connecting the parts of brass bedsteads together. Also in using heated moulds when casting the connecting, ornamental, and other parts of brass bedsteads, &c., and when casting parts of castors or vases, &c., of such articles when of brass. Also in applying twisted tapering metal tubes in the construction of parts of metal bedsteads, &c.

RICE, C. *A new or improved process of preparing cloth, so as to render it nearly, if not entirely, impervious to water, but not so to air, such cloth being particularly useful in the manufacture of boots and shoes, or various other articles of dress or utility.* (A communication.) Dated Nov. 27, 1855. (No. 2673.)

The inventor takes cotton, linen, silk, or other cloth, and coats it with a thin layer of india-rubber cement, and then suddenly heats it to from 140° to 180° Fahr.

STOTT, G. L. *Improvements in the manufacture of carbonates of soda.* Dated Nov. 27, 1855. (No. 2675.)

Claim.—The employment of the oxide of iron, the oxide of manganese, and the oxide of zinc, for the purpose of freeing vat liquor, or solution containing sulphuret of sodium, from the sulphur held in solution or combination therein.

JOHNSON, J. H. *Improvements in sheathing ships.* (A communication.) Dated Nov. 27, 1855. (No. 2676.)

This invention consists in the employment of plates of cast or shear steel for the purpose of sheathing or covering ships' bottoms.

JOHNSON, J. H. *Improvements in windlasses, capstans, and other purchases, parts of which are applicable to the transmission of motive power.* (A communication.) Dated Nov. 27, 1855. (No. 2677.)

This invention, so far as it relates to windlasses, consists in the application thereto of inclined metal rims or collars fitted on to the ends of the barrels, in conjunction with iron whelps to prevent surging. A suitable brake, actuated by a screw and hand-wheel, is also fitted on to the windlass, and an inclined ring or washer rotating with the barrel serves to effect the proper displacement of the chain or rope. This ring or washer is adapted also to capstan barrels for the same object, the requisite inclination being obtained by a pulley carried in the rotating frame of the capstan, which is fitted also with suitable anti-friction pulleys to turn upon. Small iron spheres are interposed between the rubbing surfaces in capstans to take off the friction.

JOHNSON, J. H. *Improvements in the manufacture or preparation of India-rubber and gutta percha, and in the applications thereof.* (A communication.) Dated Nov. 27, 1855. (No. 2679.)

This invention consists in mixing with gutta percha or India-rubber calcined shells, or other cheap substance of a like nature, reduced to powder. Also in constructing rollers and cylinders, and coupling or clutch boxes of spinning machines, racks, ratchets, and gearing of hand and power looms and spinning frames, plate bolsters, footsteps, collars, and bearings for the spindles of spinning machines, the bearings of driving and other shafts, back spindles of doubling and twisting machines, and bobbins, reels, and spools used in spinning machines, all of hard India-rubber or gutta percha.

WARREN, T. *Improvements in the manufacture and moulding or shaping of glass.* Dated Nov. 27, 1855. (No. 2680.)

This invention comprehends and provides for the running of the melted glass directly into the moulds or on to the table.

BARBIER, C. J. *An improved kiln for burning or firing pottery, bricks, tiles, and other earthenware.* Dated Nov. 28, 1855. (No. 2683.)

This invention is grounded on the use of a moveable furnace, conveying successively the heat through all the parts of the materials to be burnt, and on the continuous action of the gases, which successively circulate through a number of laboratories, their temperatures decreasing as they get further from the fire, thus completing the burning of such articles as are nearest, and at the same time progressively preparing the others.

RICHARDSON, G. *Improvements in buffer, draw, and bearing springs for railway carriages and waggons.* (A communication.) Dated Nov. 28, 1855. (No. 2684.)

These improvements consist in the employment of one or more hollow cylinders of vulcanised India-rubber or gutta percha, having a concave circumference, that is to say, the diameter of the cylinders at each extremity is greater than at the middle, by which means the outward bulging of the cylinders when under compression is obviated.

ROSENBERG, B. *Improvements in protecting metallic and other surfaces from corrosion and decay.* (A communication.) Dated Nov. 28, 1855. (No. 2685.)

This invention relates particularly to sheet-iron vessels, such as sugar moulds or sugar pots. The surfaces are first cleaned and smoothed by heat, any spots or specks that remain being removed afterwards by glass or emery paper. They are then coated with paint or lacquering formed as follows:—To 100 lbs. avoirdupois of triturated white lead are added 2¼ galls. of copal varnish, 1¼ galls. of spirits of turpentine, and 1¼ galls. of linseed oil. For giving a colour to the paint a small quantity of red lead or minium is added. This paint or lacquering is laid on, and the articles are then placed for six hours in a close stove heated to 250° Fahr., and afterwards for three days in a room heated to about 70° Fahr. The coating and drying processes are then repeated, the second coating being a little thicker than the first.

BROOMAN, R. A. *Improvements in the manufacture of sand, emery, and glass papers, and in the machinery employed therein.* (A communication.) Dated Nov. 28, 1855. (No. 2687.)

We shall probably give a description of this invention hereafter.

DISTIN, W. A. *Improvements in cornets and other wind musical instruments.* Dated Nov. 28, 1855. (No. 2688.)

These improvements cannot be described without illustrations.

SYMONS, T. *Improvements in the permanent ways of railways, and in the wheels rolling thereon.* Dated Nov. 29, 1855. (No. 2693.)

These improvements consist—1. In the use of a double line of rails or a twin rail. Two H-rails are placed side by side, with sufficient room between them to receive the flange of the wheel, which is placed in the middle of the breadth of the wheel, and allowed to bear upon both sides of the flange, and consequently on both rails. 2. In constructing sleepers as follows:—The patentee takes five pieces of wood of equal length and size in cross section—say about

eight ins. by four ins. He places two pieces on edge under each rail, at a distance apart equal to the thickness of the fifth piece, which is placed between the inner ends of each pair, and bolted thereto.

IRLAM, W. *Improvements in crossings for railways.* Dated Nov. 29, 1855. (No. 2694.)

This invention consists—1. In casting the point and portions of the wing rails with the foundation plate, and in chilling those parts that are liable to be worn by the action of the wheels of the carriages passing over the crossing. 2. In attaching the point to the foundation plate, as in some other crossings, and in casting flanges with the foundation plate, to which flanges steel or iron pieces are attached, to form prolongations of the wing rails. 3. In placing steel or iron filling-up pieces on the foundation plate, so that the flanges of the wheels in passing over the crossing are supported by the said filling-up pieces. 4. In an arrangement of compound chairs or plates for supporting the rails and points of crossings.

GWYNNE, J. E. A. *Improvements in instruments for indicating pressure or vacuum.* Dated Nov. 29, 1855. (No. 2695.)

The action of the improved gauge is as follows:—The pressure of the steam, gas, &c., acting through the medium of water, oil, or other fluids contained in the syphon or body of the instrument, forces up a diaphragm or piston. This motion is communicated through a piston rod to a toothed segment which gears into a pinion, and causes it to rotate, and the indicating hand with it, round a figured dial indicating the pressure applied. In another arrangement the motion of a bar or lever has a similar effect on a spring chain, cord, or other flexible medium, which causes it to coil or uncoil, and moves the hand with it.

NEWTON, A. V. *An improved process of manufacturing hats.* (A communication.) Dated Nov. 29, 1855. (No. 2697.)

The patentee describes at great length a number of processes for forming hat bodies, sizing or planking them, sticking, scalding-in, and beating them up, &c.

NORTH, G. *An improved portable apparatus for supporting and folding heads, tilts, coverings, and awnings of wheel carriages, marine vessels, goods, and ways.* Dated Nov. 29, 1855. (No. 2698.)

This invention consists in arrangements of curved or angular hoops or supports, provided with eyes or sockets, rollers or slides, for the purpose of folding. The hoops may be provided with a sufficient number of points, in order that they may be folded laterally.

BERGEON, P. L. *An improved spitting-box or spittoon.* (A communication.) Dated *Nov. 29, 1855.* (No. 2699.)

This invention consists in constructing spittoons with a cover which can be raised by depressing a pedal with the foot, and kept raised, if desired, by means of a detent, and in fitting inside the case a removeable basin.

RAMSBOTTOM, J., and J. C. DICKINSON. *Improvements in machinery or apparatus for measuring and registering water and other fluids, and obtaining motive power from the same.* Dated Nov. 30, 1855. (No. 2700.)

This invention relates to an improved method of regulating the passage of water to and from the measuring chambers of water meters, so as to obtain an uniform supply, and avoid shocks when the valves change their positions. Its principal features consist of an arrangement of valves in connection with certain measuring chambers crossed by flexible diaphragms, so as to divide each of the chambers into two, in order that the fluid entering one chamber may press the diaphragm against the side of the other, and besides discharging the fluid from the latter, give motion to the valve, indices, &c., by means of rods, one of which is attached to each diaphragm.

JOHNSON, E. D. *An improvement in the construction of attachable seconds watches.* Dated Nov. 30, 1855. (No. 2702.)

This invention relates to mechanism to be applied to watches, for putting a centre seconds hand in and out of action, the object being to enable the wearer to ascertain the deviation of certain actions, or the intervals of time between their repetition, without diverting his attention from any fleeting occurrence. The centre seconds hand is connected with the moving mechanism by friction of contact, which contact is maintained only so long as the pressure of the wearers' finger is maintained on a spring stop.

DUSAUTOY, A. *New and useful machinery for cutting cloth and other substances.* Dated Nov. 30, 1855. (No. 2703.)

The main feature of this machinery is a thin cutting blade, that may be stretched as required, in order to produce the necessary rigidity for cutting. The tension of the cutting blade, and the motion given to it, may be produced in various ways.

HANCOCK, R. *Cleaning and separating ores of every description when brought into a state of low pulverization.* Dated Nov. 30, 1855. (No. 2704.)

The ores and accompanying waste are brought into a state of solution by water, and are then, by adjustment, made to pass over tables fixed upon a given slight incline, each table having a sufficient drop from the table above. When the tables are sufficiently charged, clean water is introduced to pass over the charged table. The surface

of the tables are (in most cases) subject to the action of brushes or brooms, until the ores are cleaned. The ores thus cleaned are washed off into cisterns by water passing over the tables after they are raised to nearly perpendicular positions.

DAVIS, E. J. *Improvements in preparing food for horses and other animals.* Dated Nov. 30, 1855. (No. 2705.)

This invention consists in combining the various matters constituting the food, and then subjecting the same to great pressure and artificial heat, in order to get the food into the most portable condition for preservation and transport.

LISTER, S. C. *Improvements in treating so as to rework waste yarns of cotton, silk, flax, wool, or other fibre.* Dated Nov. 30, 1855. (No. 2706.)

The patentee first passes hard waste (or waste with the twist in it) through a machine similar to the one recently patented by him for cutting and tearing old ropes; the waste is cut in this machine to suitable lengths, which depend upon the fibre and the amount of twist. After cutting the waste into lengths, he passes it through a beating machine, then places it in a steam bath, or otherwise boils it, then passes it through a carding engine, and, if the fibres are not then sufficiently opened, again beats, and boils, or steams it, and again cards it.

WARD, W. *Certain improvements in looms for weaving.* Dated Dec. 1, 1855. (No. 2708.)

This invention consists in improved arrangements of parts for letting the yarn off the warp beam in proportion to the tension of the warp. The first mode shown by the patentee cannot be described without engravings. Another mode consists in conveying the warp, as it passes from the beam to the heddles, over a rail or roller pushed up by springs. To each end of this rail or roller is attached one end of a cord, chain, or band, which, after passing round the friction pulleys on the warp beam, is made fast to the framing of the loom.

GREY, C. E. *The use of a new vegetable material for raising the nap and dressing woollen cloths and webs and tissues.* Dated Dec. 1, 1855. (No. 2711.)

This invention consists in the application of the prickly parts of plants known in the British West Indies as "Nicker bush," or "horse eye," and called by some botanists the "Guilandina Bonduc," to the same purposes in the raising of the nap and the dressing, preparation, and manufacture of woollen cloths, and webs, and tissues, to which teasels and king-teasels are applied, and as nearly as possible in the same manner.

WOODLEY, W. A. *Improvements in the manufacture of paper bags.* Dated Dec. 1, 1855. (No. 2713.)

The sheet of paper to form the bag is placed on a suitable table to be pasted, and for this purpose a narrow trough, having its bottom formed of a piece of thick woven fabric, is used. This trough contains the paste, and it is caused by suitable mechanism to descend on the edge of the paper to be pasted. A stirrer is used inside the paste trough to cause the paste to pass freely through the bottom. The pasted paper is then removed to another machine, where it is placed on suitable supports, a plate of metal of the form of the bag then descends on to the paper, and the sides are folded by flaps over the form, which then continues its descent, and carries away the bag, which may afterwards be removed.

HARRISON, G., and W. MITCHELL. *Improvements in machinery for roving, spinning, and winding worsted, cotton, and other fibrous materials.* Dated Dec. 3, 1855. (No. 2714.)

Claims.—1. An improved combination of machinery described. 2. The application of differential wheels for giving motion to machinery, by which rovings or yarn are distributed on to spools, bobbins, or spindles.

ANDERSON, D. *Improvements in machinery or apparatus for the preparation or manufacture of felt and other fibrous materials.* Dated Dec. 3, 1855. (No. 2715.)

According to the present invention the primary preparing machine or "Devil," acting as a teaser or opener, is combined and worked in concert with the finishing cylinder or apparatus, the two working together as one machine. An additional improvement consists in fitting to the wire cylinder a self-acting door, which opens and closes at each revolution, and causes a constant current of air to pass through, thereby cleansing the materials operated upon.

WALTON, F. *An improvement or improvements in papier maché trays.* Dated Dec. 3, 1855. (No. 2717.)

This invention consists in the use of glass or enamel for the bottoms of papier maché trays, the object being to prevent scratching and injuries by heat and otherwise.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

KIRBY, S. A. *Improvements in open stoves and grates for rooms and apartments.* Dated Nov. 27, 1855. (No. 2674.)

In this invention the products of combustion which arise from the fire, together with heated air passing over the fire, are caused to pass, for the most part, through openings at the back of the stove or grate, and then, by a back descending flue, under

the fire, and into a hollow hearth, by preference formed above the ordinary fixed hearth. They then pass into two upright flues, one on each side of the fire, and then into the chimney, some passing down through the fire.

JOHNSON, J. H. *Improvements in cleaning and hulling grain and seeds, and in the machinery or apparatus employed therein.* (A communication.) Dated Nov. 27, 1855. (No. 2678.)

The applicant describes a machine composed of a suitable frame, fitted with a hopper, into which the grain is placed, and from which it falls on to and through a vibrating perforated plate which answers the purpose of a smut machine. The grain then enters a fixed drum lined with plates roughed like a file. Inside this drum rotate curved blades, also fitted with similar plates, by which the grain is partly hulled. The hulling is carried out in a second huller similar to the first. On leaving this, the loose husks are blown off by an adjustable ventilator. The grain then falls into an endless travelling belt, fitted with brushes, which brush it against a set of roughened plates, and entirely remove the husks. Vibrating sieves serve finally to separate the loose husks from the grain.

RICHARDSON, G. *Improvements in chain cables and other chains.* (A communication.) Dated Nov. 27, 1855. (No. 2681.)

This invention relates to an arrangement of the links, whereby the operation of welding is entirely dispensed with, and consists in forming the links of a metal bar coiled over an anvil or mandril into an oval, or other form, a sufficient space being left in the centre for the adjoining links. The two ends of the coiled bars terminate one over the other, or both on the same side of the link, and each have a knob or projection formed on them, in which position they are secured by a suitable shoe or metal clip, fitted on to the link, and held in its place by the knobs or projections.

HOLT, C. H. *Improvements in steam boilers, furnaces for the same, and apparatus connected therewith.* Dated Nov. 28, 1855. (No. 2682.)

The inventor has a heating apparatus to partially heat the water before it enters the boiler, fixed between the engine and the boiler, and he adds to the equalising valve a syphon into which he places mercury to act upon a float and work the valve; he has also an apparatus to take off the water produced by the condensed steam from the pipes without allowing any steam to escape.

LEE, J. *Improvements in agricultural or farmers' engines, which improvements are applicable also to locomotive engines.* Dated Nov. 28, 1855. (No. 2686.)

This invention relates to the boilers, fire-boxes, and ash-pans of agricultural and locomotive engines with oblong fire-boxes, and consists in making the fire-box and ash-pan in one piece, and continuing the boiler plates underneath the ash-pan, so as to leave one continuous water space round the sides of the fire-box and underneath the ash-pan.

WOLFF, S. *Improvements in obtaining motive power.* Dated Nov. 28, 1855. (No. 2689.)

This invention is founded on the law, that when a body is placed in a fluid of a specific gravity greater than itself it will have a tendency to rise, and when in a fluid of a less specific gravity, a tendency to fall. The inventor proposes to construct an endless hollow or light chain, the links of which shall present the appearance of a cylindrical cord. This he mounts upon guide wheels capable of adjustment to bring the chain to tension, and causes the chain to traverse through vertical cylinders, one filled with mercury, water, or other heavy fluid, and the other with a lighter fluid.

WALKER, J. *Improvements in the manufacture of textile fabrics.* Dated Nov. 28, 1855. (No. 2690.)

These improvements consist in producing a woven fabric, so that the face side is of one weft or material, and the back of it of another, by weaving the fabric in a power loom in which there is a double or compound shuttle-box provided with two or more shuttles, for throwing wefts of different materials, according to the diameter of the fabric required.

CLARKE, C. *Improvements in applying roughings to the feet of horses.* Dated Nov. 28, 1855. (No. 2691.)

This invention has for its object the construction of temporary shoes with roughings, to be worn by horses over the ordinary shoes.

FORDE, A. W. *Registering the number of revolutions of a wheel of a locomotive engine, or railway, or other carriage, at any given period.* Dated Nov. 29, 1855. (No. 2692.)

The principle used in this invention is that of revolving balls suspended from moving levers, similar to the governor of a steam engine, which balls are put in motion with more or less velocity, and as they extend the levers produce an action on an indicator hand which registers the speed.

ARCHER, C. M. *A new material for the manufacture of paper, and for the production of textile fabrics.* Dated Nov. 26, 1855. (No. 2696.)

The inventor takes sea and fresh water weeds, washes them, and boils them for a given period, preserving for various uses the resulting products. He then dries, crushes,

triturates, or scutches them, and thereafter steeps or boils them in a solution of alkali, and subsequently in an acidulated solution, and then in a solution of alkali, or he subjects the material to the oxymuriatic dry gas process. The epidermis of the stems being detached, the filamentous matter is beaten up into pulp, together with the matter produced by the fronds, roots, and epidermis if desirable.

HUMPHREYS, H. T., and J. LOUGHRY. *Improvements in machinery or apparatus for cleaning wheat.* Dated Nov. 30, 1855. (No. 2701.)

These improvements consist in the employment of a revolving polygonal drum composed of strong wire or perforated metal plates, through which drum the wheat is slowly passed, in place of tearing it with brushes or beaters, the weight of the wheat being sufficient to accomplish the object.

PONTIFEX, E. A. *Improvements in furnaces.* Dated Dec. 1, 1855. (No. 2707.)

This invention consists in the insertion of a hollow bridge, or hollow screen open at bottom, which descends from the top of the furnace, and in connecting therewith air tubes or passages open at one end to the atmosphere. This screen is used as well as the ordinary fire-bridge, and is fixed so as to prevent any of the products of combustion passing, except between the bottom thereof and the furnace bars.

NEEDHAM, W., and J. KITE. *Improvements in machinery or apparatus for expressing liquids or moisture from substances.* Dated Dec. 1, 1855. (No. 2709.)

The inventors make slabs or trays, and indent or groove them on either side, or raise projections thereon when required, and to place them one above the other, with lathes or blocks between them, forming chambers or cells. The whole are bound by ties, or placed in the frame of an hydraulic press. They place in each of such chambers a slab or tray, or cloths to assist in the expression of the moisture. Where cloths are used, they attach them to a force pump regulated by a safety valve. The material to be operated upon is forced into the cloths, and, meeting with resistance from the ties or frame of the press, the mixture escapes through the cloths and is carried off through the channels, leaving the residue in the chambers.

GARDNER, J. *A method of treating tea for economizing its use and transport.* Dated Dec. 1, 1855. (No. 2710.)

The inventor reduces tea of any kind by ordinary mechanical means to a powder, and submits it to pressure.

NAPIER, J. M. *An improvement in drying small coal.* Dated Dec. 1, 1855. (No. 2712.)

This invention consists in causing small coal, when wet or damp, to be passed through a stove or oven constructed so that it may be fed in at one end, and by the working of the parts thereof, or the machinery in connection therewith, be progressively moved through, and delivered at the other end.

MAYER, C. *Improvements in hair trigger locks for fire-arms.* Dated Dec. 3, 1855. (No. 2716.)

The inventor uses the ordinary percussion or flint-lock, but instead of the seer that takes the half and full cock notches on the tumbler being formed with an arm to be operated on by the ordinary or hair trigger to discharge the hammer, he constructs the said seer without this arm, and applies a separate dog or blocking piece behind the rear end of it, kept towards the same by a spring, and this dog has the arm on it which takes the ordinary trigger.

PROVISIONAL PROTECTIONS.

Dated June 11, 1856.

1386. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the manufacture of safety paper. A communication from V. Courboulay, of Paris, France.

Dated July 1, 1856.

1540. James Atkinson Longridge, of Fludyer-street, Westminster, Middlesex. Improvements in the application of mechanical power to ploughing and other field operations of agriculture.

1542. John Lacey Davies, jun., of Manchester, Lancaster, engineer, and John Broadbent, of the same place, manufacturer. Certain improvements in umbrellas and parasols.

1544. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improved construction of door lock. A communication.

1546. George Edward Dering, of Lockleys, Herts. Improvements in galvanic batteries.

1548. Matthew Hill Loam, of Nottingham, engineer. Improvements in meters for measuring water and other fluids.

Dated July 2, 1856.

1550. Joseph Henry Van Hengel, of Chaussée de Malines, Anvers, Belgium. Improvements in apparatus for raising and lowering bodies in mines.

1552. James Fleming, jun., of Newlands-fields, Renfrew, N. B., bleacher. Improvements in bleaching, washing, cleansing, and preparing textile fabrics and materials.

1554. Edwin Green, of Birmingham, Warwick, manufacturer. Improvements in the manufacture of buttons.

1556. Alfred Nourisson, of Rue des Petites Ecuries, Paris. Improvements in drying and burning bricks and other articles of clay.

1558. John Williamson and James Cochran Stevenson, of South Shields, alkali manufacturers. Improvements in evaporating saline solutions.

1560. William Hickling Burnett, of Margaret-street, Middlesex, gentleman. Improvements in electric telegraphs, and in apparatuses employed therein.

1562. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Certain improvements in machinery for manufacturing rope or cordage. A communication.

Dated July 3, 1856.

1563. John Pendlebury, of Crumpsall, Lancaster, bleacher. Improvements in machinery or apparatus for bleaching or cleansing textile fabrics or materials.

1564. Joseph Ewing, of Cirencester, Gloucester. A new or improved portable receptacle for urine and other human secretions.

1565. John Caleb Hall Peirce, of Upper Northplace, Gray's-inn-road, Middlesex, commercial traveller. Improvements in glass chandeliers, lustres, and other such means used in lighting.

1566. David Curwood, of Grocers'-hall-court, London. Improvements in horse rakes, which improved rakes may also be rendered applicable for scarifying land.

1567. Joseph Brown, of Leadenhall-street, London, cabinet manufacturer. Certain improvements in hats and caps.

Dated July 4, 1856.

1568. Hilton Greaves, of Oldham, Lancaster, manufacturer. Improvements in looms for weaving.

1569. Edwin Greenslade Bradford, of Torquay, Devonshire. An improved rudder.

1570. Thomas Chandler, of Paradise-street, Rotherhithe. A lever cask stand.

1572. Robert Luke Howard, of Whitecross-street, Middlesex, engineer. Improvements in valves for regulating the flow of fluids.

1573. John Henry Johnson, of Lincoln's-inn-fields, Middlesex. Improvements in machinery or apparatus for cleaning and carding cotton and other fibrous substances. A communication from G. A. Risler, of Cernay, France, engineer.

1574. Louis Cornides, of Trafalgar-square, Charing-cross, Middlesex. Improvements in cementing and uniting together plain or ornamented surfaces of glass, or in uniting surfaces of glass to surfaces of metal or other material.

Dated July 5, 1856.

1575. Edwin Travis, of Oldham, Lancaster, engineer, and Joseph Louis Casartelli, of Manchester, Lancaster, optician. Certain improvements in steam engines.

1576. Jens Foss, of Manchester, engineer. Improvements in machinery for cutting and sawing.

1577. Joseph Adshead, of Manchester, gentleman. A new application of a known material to be used as a substitute for plastering, painting, papering, whitewashing, and colouring.

1578. Joseph Lewtas, of Manchester, manufacturer, and John Humphreys the younger, of the same place, mechanic. Improvements in apparatus for holding and releasing cords, chains, bands, or bars.

1579. James Alexander Manning, of the Inner Temple, London, esquire. Improvements in the manufacture or production of manure.

1580. Paul Charles Joseph Léonce de Combettes, civil engineer, of Lyon, French empire. An improved steam engine.

1581. Jean Marie Letestu, manufacturer, of Paris, French empire. Certain improvements in extracting liquids and solid or pasty matters.

1582. Thomas Smith, of Bredfield, Suffolk. Improvements in horse rakes.

1583. Lorenzo Blackstone, of Lawrence-lane, London, merchant. Improvements in the manufacture of corks and bungs. A communication.

Dated July 7, 1856.

1584. Frederic James Pilliner, of Hatfield-street, Stamford street, Blackfriars-road, Surrey. Improvements in clasps or fastenings for waistbands and other descriptions of bands or straps.

1585. Robert Millward, of Patricroft, Manchester, foreman. An improved instrument which may be used as a screw key or gauge.

1586. Robert Shaw, of Portlaw, Waterford, Ireland, cotton spinner. Improvements in obtaining pressure applicable to machinery for preparing and spinning cotton and other fibrous materials and other purposes.

1591. George Sampson, of Bradford, York, stuff finisher. Improvements in finishing fabrics.

1592. William Colborne Cambridge, of Bristol, agricultural implement maker. An improvement in the construction of press wheel rollers and clod crushers.

1593. Henry Smith, of Brierley-hill Iron Works, near Dudley, Worcester, manufacturer. An improvement or improvements in the manufacture of harrows.

1594. James Horsfall, of Birmingham, Warwick, manufacturer. An improvement or improvements in the manufacture of wire rope.

1595. William Laing, of Denny, Stirling, N.B., manager. Improvements in stretching or breadthening woven fabrics.

1596. Paul Charles Joseph Leonce de Combettes, civil engineer, of Lyon, French empire. Certain improvements in rotary steam engines.

1597. Edward Charles Healey, of Sidmouth-lodge, Old Brompton, and Edward Ellis Allen, of Strand. An improvement in preparing for use veneers, paper, and other fabrics or sheets made of fibres.

1598. Henry Bollmann Condy, of Battersea. Improvements in defecating or purifying acetic acid and other solutions, also in disinfecting rooms and other places, and in preserving wood.

1599. John Henry Noone, of Peter-street, Sun-street, Bishopsgate. Improvements in apparatus for retarding and stopping carriages on railways.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," July 22nd, 1856.*)

228. R. Barrow. An equilibrium slide-valve for steam engines.

588. J. Collins. A machine for pulverising, crushing, pressing, and cleaning land.

590. O. Maggs. Improvements in the straw-shaking apparatus of thrashing machines.

591. H. Petitpierre. Improvements in sawing or cutting stone.

603. J. N. Ryder. An improvement in slide valves of steam engines.

610. I. Dixon. An improved propeller for steamships and other vessels.

612. T. Porter. Improvements in looms for weaving carpets, coach lace, velvets, and other piled fabrics. A communication.

645. J. Drury. Improvements in steam boilers for preventing explosion thereof.

664. P. A. L. Fontainemoreau. Improvements in looms for weaving. A communication.

667. W. C. T. Schaeffer. An improvement in treating soap-suds and wash waters.

669. J. Trueman. Improvements in ovens for baking.

670. W. Drummond. Improvements in spring hinges for swing doors.

674. W. Glover. Improvements in the construction and arrangement of machinery or apparatus for damping and beetling woven fabrics.

680. H. Brierly. Improvements in self-acting mules for spinning and doubling.

694. P. Brown and G. Brown. An improved ash pan for fire-grates.

696. J. Tysoe, C. Tysoe, and P. Foxcroft. Certain improvements in machinery or apparatus for roving, spinning, and doubling cotton, and other fibrous substances.

704. J. Aspinall. Improvements in apparatus for obtaining extracts and decoctions.

717. A. Tolhausen. A new process of producing chemical writing, and of marking and inscribing chemically any characters or figures upon paper or other substance of similar character. A communication.

718. A. Tolhausen. An improved mode of manufacturing porous earthenware. A communication.

728. W. E. Newton. Improvements in macerating substances to be employed in the process of distillation. A communication.

730. A. Tolhausen. Certain improvements in watches and other time-keepers. A communication.

747. J. Harrison. Producing cold by the evaporation of volatile liquids in vacuo, the condensation of their vapours, by pressure, and the continued re-evaporation and recondensation of the same materials.

749. J. Harrison. Distilling or evaporating in vacuo, condensing the vapour by pressure, and economising heat.

752. A. Sands. Improvements in securing rails in railway chairs and in the construction of railway chairs.

809. F. W. Kitson. Improvements in the manufacture of railway wheels.

814. R. Halliwell. Certain improvements in the machines for spinning, called self-acting mules. A communication.

873. A. Perpigna. Improvements in the manufacture of coke. A communication.

974. T. Squire and C. F. Claus. Improvements in the manufacture of artificial manure.

975. J. S. Perring. Improvements in chairs for railways.

989. F. W. Blacket. An improvement in the construction of keys and locks, and in the fitting of locks, to afford increased safety.

1060. W. Gregory. An improvement in the construction of roofing tiles.

1188. G. Wilkinson. Improvements in steering apparatus, and in giving motion to machinery for raising and moving weights.

1198. D. Shaw. Improvements in looms and apparatus employed therewith for weaving.

1201. A. H. Dufresne. An improved process of gilding and ornamenting steel and other metals.

1250. B. N. de Buifon. A new apparatus for clarifying and purifying water and other liquids.

1290. H. Bessemer. Improvements in shaping, pressing, and rolling malleable iron and steel.

1292. H. Bessemer. Improvements in the manufacture of iron and steel.

1322. M. R. Leverson. Improvements in tackle blocks. A communication.

1337. A. L. Gibon and A. Fröhlich. Certain improvements in economising fuel in the treatment of metals.

1473. H. H. Vivian, B. G. Herrmann, and W. Morgan. Improvements in the manufacture of copper, and in obtaining gold and silver from the ores employed in such manufacture.

1503. H. Waller. Improvements applicable to vessels used in the manufacture of cheese.

1552. J. Fleming. Improvements in bleaching, washing, cleansing, and preparing textile fabrics and materials.

1558. J. Williamson and J. C. Stevenson. Improvements in evaporating saline solutions.

1569. E. G. Bradford. An improved rudder.

1587. A. L. S. Chenot and E. C. A. Chenot. A method of extracting eliminating extraneous substances from steel sponges.

1588. A. L. S. Chenot and E. C. A. Chenot. Improvements in sorting ores or separating metals from each other, and from certain combinations with other substances.

1589. A. L. S. Chenot and E. C. A. Chenot. Improvements in machinery for compressing metallic sponges and other substances.

1590. A. L. S. Chenot and E. C. A. Chenot. Improvements in apparatus for the reduction of metallic oxides.

1595. W. Laing. Improvements in stretching or breadthening woven fabrics.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEARS' STAMP DUTY HAS BEEN PAID.

1853.

1688. Charles Goodyear.
1690. Charles Goodyear.
1693. Charles Goodyear.
1694. Charles Goodyear.
1695. Charles Goodyear.
1701. Benjamin Burrows.
1705. John Wallace Duncan.
1712. Peter Armand Lecomte de Fontainemoreau.
1714. Charles Breese.
1718. James Shield Norton and Henry Jules Borie.
1728. Edward Cockey, Henry Cockey, and Francis Christopher Cockey.
1731. Thomas Gray and John Reid.
1736. William Huntley.

LIST OF SEALED PATENTS.

1856. *Sealed July* 18, 1856.

135. Miguel de Bergue.
149. Edward Pickering.
157. John Coope Haddan.
177. Alexandre Tolhausen.
189. Charles Rothwell.
237. William Henry Lancaster and James Smith.
282. George Norgate Hooper and William Hooper.
299. Elisha Smith Robinson.
785. Etienne Laport.
1118. Barnett Samuel.
1179. John Wilkes, Thomas Wilkes, and Gilbert Wilkes.
1219. John Charles Pearce.
1223. Job Cutler.

1856. *Sealed July* 22, 1856.

185. Stephen Norris.
190. John Stafford.
191. John Gimson and George Gimson.
198. Andrew Shanks and Francis Herbert Wenham.
210. George Napier.
212. Edward Vincent Gardner.
218. William Beasley.
222. John Wormald.
230. William Asbury.
287. Benjamin Franklin Miller.
289. James Townsend Ward.
310. Michael Leopold Parnell.
333. Richard Archibald Brooman.
340. Charles Walker.
359. Richard Archibald Brooman.
464. George Holme Spencer.
573. Frederick Hale Holmes.
748. Samuel Getley.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
June 27	3852	J. G. Webber	Charterhouse-street	Double vest.
30	3853	Burney and Bellamy	Millwall	Iron tank lid.
,,	3854	Burney and Bellamy	Millwall	Regulating spout.
July 3	3855	S. Pemberton and Son	Birmingham	Sash fastening.
9	3856	Tucker and Son	Strand	Tent lamp and case.
11	3857	Waterlow and Sons	London-wall	Date indicator.
14	3858	A. G. Bayliss and Co.	Redditch	Needle case.
15	3859	J. and M. Robson	North Shields	Closet cistern.
17	3860	H. Whittell	Leamington	Albert boot.
24	3861	W. P. Marshall and J. Ross	Birmingham	Waggon hopper fastening.
,,	3862	G. Neale	Northampton	Gas stove.

PROVISIONAL REGISTRATIONS.

June 30	779	A. Hutchings	Haymarket	Melometer.
July 7	780	T. Pope	Cheapside	Cotton case.
9	781	H. L. Burton	Islington	Wheel-break and guard for children's carriages.
10	782	J. Coney	Birmingham	Safety bar.
11	783	H. Millward and Sons	Redditch	Needle case.
15	784	J. Kendrick and D. O. Paviour	Birmingham	Clasp.
17	785	A. Brasier	Southwark	Hat.

NOTICES TO CORRESPONDENTS.

J. D. D.—Your letter on the voussoirs of arches would be much more intelligible if illustrated by a diagram. Will you forward one, accompanied by a description?

John Hope.—If you will be good enough to send us a carefully-prepared sketch of your proposed method of applying steam to the breaks of railway carriages, we will further consider the matter.

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LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, *in the City of London*.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, *Dublin; W. C. Campbell and Co.*, Hamburg.

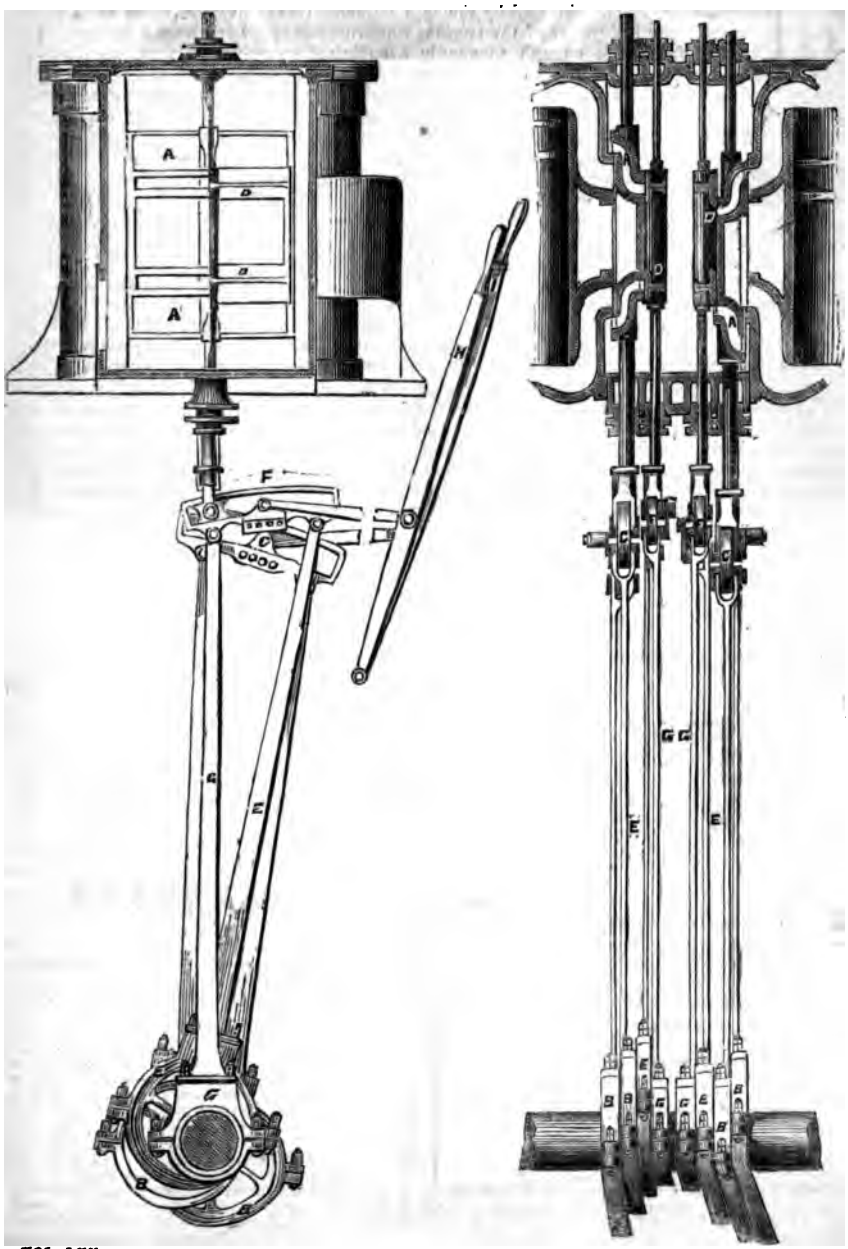
Mechanics' Magazine.

No. 1721.] SATURDAY, AUGUST 2, 1856. [PRICE 3D.

Edited by R. A. Brooman, 166, Fleet-street.

WYMER'S DOUBLE SLIDE EXPANSION VALVE FOR MARINE ENGINES.

Fig. 1. Fig. 2.



WYMER'S DOUBLE SLIDE EXPANSION VALVE FOR MARINE ENGINES.

BY THE INVENTOR.*

THE writer, feeling convinced of the necessity of using expansion valves for the engines of screw steamers, applied the valves described in the present paper to the engines of the screw ship *Lord Raglan*, one of the Tyne and Continental Steam Navigation Company's vessels, built on the Clyde.

The objects sought to be obtained by the application of these valves are, first, to afford a facility for using the full power of the engines when necessary for any length of time, the boilers being made large enough to supply a sufficient quantity of steam, even when cleaning the fires, and to allow of the necessary amount of blowing off at sea. Secondly, to provide an efficient expansion valve for reducing the power of the engines to any limit required, so as to gain an increased advantage in the results obtained from the consumption of a given quantity of fuel, compared with that which could be gained by the ordinary practice of wiredrawing the steam by the regulator valve. Thirdly, to provide the means of altering the degree of expansion, without at the same time altering the lead of the valve, or the time of exhausting from the cylinder into the condenser.

The valves are shown in figs. 1 and 2 of the engravings on the preceding page; they are a modification of Messrs. Hawthorn's expansion valves for locomotive engines. The slide valve, A, of each engine is worked by a pair of eccentrics, B B, connected by a link, C, for reversing the motion in the ordinary way. A cut-off slide, D, is placed on the back of the slide valve, A, through which the steam has to pass, and this is worked by a third eccentric E, through an expansion link, F. The lower end of the link, F, is connected to a concentric ring, G, on the axle, and is consequently stationary, so that by sliding the rod of the cut-off slide, D, to the lower end of the link, its motion is stopped, and the valve remains full open throughout the stroke, the engines then working at their full power. The expansion link, F, can be adjusted by the lever, H, to cut off the steam at any point required in forward gear, and the combined action of the two slides gives a more prompt cutting off with less wiredrawing of the steam than in the case of the ordinary single slide valve. In backward gear the ordinary slide, A, alone is required to act, the reversing being effected by the lever, I; the link, C, is used only for reversing, and can be fixed only in the extreme positions of forward and backward gear, the expansion being regulated by the cut-off slide, D, alone.

In the engines shown in the figures, the pistons have 30 inches stroke, and the main valves, A, are set to cut off at 22½ inches or ¾ths from the commencement of the stroke. By moving the link, F, to any point between the centres of the two rods, E and G, and thereby varying the length of travel of the expansion valve, D, the steam may be cut off at any point between ¾ths of the stroke, when the rod, G, is in full gear, and the engines are working at their full power, and ¼th of the stroke, when the rod, E, is in full gear, and the expansion is carried out to the maximum degree.

This arrangement of valves has been in constant use on board the screw steamer *Lord Raglan* for the last nine months, during which time the vessel has run 14,000 miles, and the valves have given every satisfaction as to their efficiency by the economy of fuel attending the use of them, and by their non-liability to derangement, and the ease with which their working can be regulated at any time according to the situation in which the ship may be placed, so as either to employ the full power of the engines, or to economize fuel for a long voyage by working expansively.

The following Table shows the results obtained from experiments at sea, including loss by blowing off necessary to keep the boilers clean, cleaning of fires, &c., incidental to steam navigation.

Consumption of Fuel of the "Lord Raglan" Screw Steamer, with the Double-Slide Expansion Valve.

Expansion in per centage of Stroke.	Number of Strokes per minute.	Comparative Speed of Ship.	Loss of Speed of Ship.	Consumption of Coal per hour.	Per Centage Consumption of Coal.	Per Centage Saving of Coal.	Per Centage gain of distance run by same Consumption of Coal.
Per cent.				Cwts.	Per cent.	Per cent.	Per cent.
25	75	100	...	18	100	...	...
33	75 nearly	100 nearly	0 nearly	18 nearly	100 nearly	0 nearly	0 nearly
45	72	96	4	16	86	11	7½
50	69	92	8	13	72	28	22
58	67½	90	10	10	59	44	38

* *Read before the* Institution of Mechanical Engineers, Birmingham.

The description of coals used in the above trials was West Hartley.

In consequence of the absence of the vessel in the Crimea, the writer has not been enabled to give the general results up to the present time, as he had expected to do.

Mr. Wymer exhibited a model of the double-slide valve, and showed the action of the cut-off slide with various degrees of expansion. He also remarked, in reply to questions, that both of the valves were of cast-iron, as well as the cylinder faces; they were not found to be worn after running 14,000 miles, but remained in a very good state; the vessel was at present abroad, and the valves had been examined in the week previous to her last sailing. He had at first used the ordinary link motion for marine engines, but had found a difficulty in preventing the engine from "knocking on the centres," in consequence of the increase of lead at high degrees of expansion, and the additional defect of variation in the exhaust that took place with the ordinary link motion. These circumstances affected large engines seriously, although they were not of importance in small quick-moving engines, such as locomotives. By the use of the double-slide valve that had been described, the lead was kept the same, and the exhaust remained constant for all degrees of expansion, the amount of expansion being regulated by the cut-off slide.

THE LUNAR ROTATION.

COMMUNICATED BY DR. LARDNER.*

THE discussion of the problem of the moon's rotation commenced some time since in the *Times* newspaper, by a letter to the editor signed "Jelinger Symons, one of her Majesty's inspectors of schools," has assumed a curious, anomalous, and somewhat undesirable position. Had such a communication been anonymous, or even had it been merely signed "J. Symons," it would most probably have excited no attention, and the subject would have been allowed to pass without further notice. But the adjunct announcing the peculiar office of the writer, was sure to attract attention. Thousands who never before thought of the question, or, if they did, never entertained a shadow of doubt upon it, came to reflect upon it and to consider the arguments of one who, from the peculiar functions exercised by him under Royal authority, must naturally be regarded with some consideration and respect. The arguments were specious and plausible, and naturally puzzled all who, hitherto relying chiefly upon the authority of all the great astronomers past and present, had assented to the moon's rotation. Letters opposing the views of Mr. Symons were published, some of which treated him with ridicule, others gave such reasons in support of the universally accepted doctrine as were suitable to a newspaper, but nowhere that I know of was the subject taken up by any scientific authority of acknowledged eminence, nor was any demonstration of the principle offered. The great leaders of the corps of science, in short, maintained a disdainful silence, as though the question raised were unworthy of serious notice, and ought to be consigned incontinently to the limbo in which the problem of the perpetual motion and *hoc genus omne* slumber.

Mr. Symons, availing himself of his personal acquaintance with the Astronomer Royal, attempted to draw out that eminent person, by proposing to him a series of queries on the subject, to which he obtained written answers, with permission to publish them; Professor Airy, however, observing truly that his answers contained nothing which is not extensively known.

How does the affair then stand at present? The whole body of scientific men, past and present, of generally acknowledged authority, are agreed that the moon has axial rotation. The axis and the rate of that rotation are exactly assigned. Mr. Jelinger Symons, an inspector of her Majesty's schools, and Mr. Evan Hopkins, a graduate of Cambridge, of considerable scientific attainments, have had the moral courage to come forward in the public journals affirming, not only that the whole scientific body past and present is wrong, but even *ridiculously wrong*. I do not mean to speak here with anything but respect of these gentlemen, and I think the large share of the public attention which they have attracted demonstrates, as I stated in

* Notwithstanding the ample discussion which was published in our sixty-first and sixty-second volumes, respecting the views entertained by Mr. Jelinger Symons and Mr. Evan Hopkins on the moon's motion, we think the above article from the pen of Dr. Lardner will be well received by our readers, particularly as the recent expansion of the controversy in the *Times* newspaper, and in Mr. Symons's pamphlet, has imparted fresh interest to the subject of dispute. Although we do not think it advisable to refuse insertion to every letter that may reach us in reply to Dr. Lardner, we nevertheless desire our readers to understand that letters on the subject will not be inserted unless they possess special claims or *merits*.—*Ed. M. M.*

the *Times*, that there must be something deficient or obscure in the ordinary process by which the moon's rotation is established in elementary works. There can be no manner of doubt that what Mr. Symons has published has staggered the faith of thousands, and it seems to me very desirable that some form of demonstration of the point in question should be found, which is not too mathematical or technical to be generally appreciated and understood. I have waited in the hope that some scientific man of more authority and ability than myself would supply this, but as none other has done so, nor, so far as I know, intends to do so, I shall attempt to supply a form of proof which, though inevitably involving the use of mathematical symbols and reasoning, will, I hope, be generally understood.

I must first observe, that Mr. Symons puts forward with considerable effect what he regards as a crushing argument *ex absurdo*. He says that if the moon revolves on her axis everything on the earth is so revolving. Mr. Symons, Mr. Hopkins, Dr. Lardner, the Astronomer Royal, and the rest, are all spinning on their several axes once in twenty-four hours! I mentioned this consequence myself in the first letter which I sent on the subject to the *Times*. I there stated that the same argument which proves the moon to rotate in twenty-seven days and some hours would equally prove Wyld's great globe to rotate in 23 hours 56 minutes; and I added, "A mountain—the Peak of Teneriffe, for example—is moved round the centre of its parallel of latitude, presenting always the same side to that centre. This mountain is not a globe, like the moon, and has no geometrical line analogous to the moon's axis; but that does not affect the principle of the question. *The same reasoning which proves the moon to rotate on its axis must establish, with equal conclusiveness, the rotation of the Peak of Teneriffe upon a certain line as an axis of rotation, that line passing through the mass of the mountain in a direction parallel to the terrestrial axis*, the time of rotation being 23 hours 56 minutes.

"I can only repeat, that the point requires more clear exposition than it has yet received."

Now, undoubtedly if rotation be denied to these and other objects carried round by the diurnal motion of the earth, it cannot be claimed for the moon. Are we, then, to admit the conclusiveness of Mr. Symons's *ex absurdo?* I say at once, no! and affirm that, absurd as it may appear to Mr. Symons, all the terrestrial objects he mentions, *his own* body and mine, and that of *the Astronomer Royal, and the rest*, do all and severally actually rotate in 23 hours 56 minutes, the difference between their case and that of the moon being merely in the *cause* of the rotation. The former are compelled to rotate because they are part and parcel of the earth. The latter rotates by reason of the peculiar direction of the projectile force which originally launched it into space.*

To deal with the problem of rotation as applied to the moon itself would necessarily involve very complicated and abstruse mathematical processes and formulæ, so technical as to be totally unintelligible to any except professed astronomers. I shall therefore at once strip the question of all this complexity by presenting it under its most general conditions, and divested of all those disturbing actions which are so well described by the Astronomer Royal as "pulling about the moon."

Let us suppose, then, a body to move in a circular orbit with an uniform motion round a centre of attraction, so that it shall in all positions present the same aspect to that centre; and let us further suppose that this system is free from the action of all disturbing forces exterior to it. In such case the revolving body will continue for an indefinite time to move in the same circular orbit round the centre of attraction, and will continue always to present the same aspect to that centre.

But in order still further to simplify

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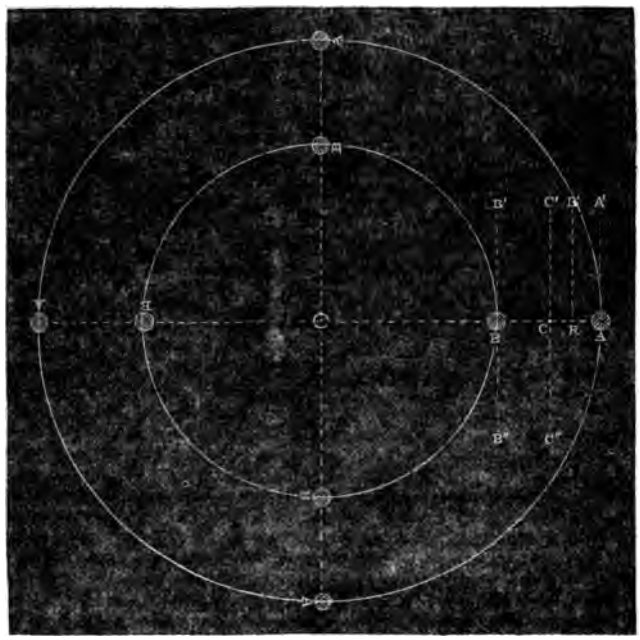
* It is worthy of remark that the fact here insisted upon by Dr. Lardner was put in a very forcible manner in our sixty-first volume, by our correspondent "Dejere," who wrote (in No. 1636) as follows:

"I am not surprised that to Mr. Mushet, and to other persons whose attainments are probably the results mainly of practice and observation, it appears an absurdity to state that, since the moon constantly presents the same hemisphere to the earth, she must rotate on her axis once during her monthly revolution. It would naturally appear so in the same manner, and for the same reason, that it would seem to them absurd to make the following equally true, and perfectly analogous statements; viz., that St. Paul's Cathedral is perpetually spinning round the top of the golden cross on its summit; or that Lord Nelson, who apparently stands so demurely on his column in Trafalgar-square, is everlastingly employed in throwing summersaults before the populace. Or, again, the moon revolves about its axis in the same fashion, and upon the same principle as that by which those individuals who dwell north or south of the equator, rotate about innumerable oblique axes, and thus describe an immense variety of cones (supposing they stand still for a day.)"

Again (in No. 1638) he says:

"The moon may, for the purposes of the present discussion, be supposed to be sustained on the summit of a terrestrial mountain, and form part of the earth. Therefore its motion may be considered of the same character as that of St. Paul's, the Nelson Statue, or any similar object. Hence my former remarks."—Ed. M. M.

the question, without in the least divesting it of those conditions the effects of which we seek for, let us suppose the body thus revolving to consist of two equal small masses A and B, connected by a rigid rod, which for greater simplicity we shall consider to be divested of inertia, and we shall suppose the bodies to be so placed that this connecting rod is directed to the centre O, round which the motion of revolu-



tion takes place. As A B revolves, therefore, the centres of the two small masses will describe concentric circles round O, and at the four quadrantal points of the circle the masses will assume the positions indicated in the figure.

We are now to demonstrate that under such circumstances the system A B will rotate uniformly round its centre C, making one complete rotation in the time which it takes to make one complete revolution round the centre O.

It is well understood in mathematical physics, that a point revolving in a circle is affected at once by two forces, one directed to the centre of the circle, and thence called the centripetal force, and the other directed along a tangent to the circle drawn through the place at which the point is moving, and called the tangential or projectile force. If the body be suddenly deprived of the action of either of these forces, it will immediately move in the direction of the other. If the central attraction be suddenly suspended, *the body will* move with the velocity it had in the circle in the direction of the tangent to the circle drawn from the point at which the body was found at the moment of the suspension of the central force.

This being admitted, let A A′ be a tangent to the circle in which A moves, and B B′ a tangent to the circle in which B moves. Let us suppose that when the revolving body has the position represented on the right of the figure, the central action towards O is suddenly suspended. In that case A will have a tendency to move in the direction of A A′ with the velocity with which it was previously moving, and B will in like manner have a tendency to move in the direction B B′ with its previous velocity. But the two masses being by the supposition connected by the rigid rod A B so as to form what in mathematical physics is called an invariable system, these two forces will be compounded, and their actual effect will be determined by the principles of the composition and resolution of forces.

To apply these principles, I shall have to use some mathematical symbols, which, however I shall render as simple as possible.

Let C O = R and C A or C B = r.

Then we shall have,

O A = R + r O B = R − r.

Let A in revolving round O move in one second over a space which is the fractional part of the radius O A expressed by a. It is evident that the space moved over in one second by B will be the same fractional part of the radius O B. The velocity of A, or the space it moves through in one second, will then be a (R + r), and the velocity of B will in like manner be a (R − r).

Now, according to what has been explained, if we suppose the central attraction towards O to be suspended, the mass A will be affeccted by a force which will be found by multiplying the mass by the velocity a (R + r), and the mass B will in like manner be affected by a force found by multiplying the mass B by its velocity a (R − r). Since these masses are equal, let them be each expressed by m, and we shall have,

force of A = ma (R + r)
force of B = ma (R − r).

By the principles of the composition of parallel forces,* the resultant of those two forces will have an intensity equal to their sum, that is, to 2 ma R, and it will have a direction parallel to that of the components, and dividing the space between them in the inverse ratio of the forces, just as the fulcrum of a lever divides the space between the power and weight when these are in equilibrium.

Let R R′ be the direction of this resultant, and let the distance R C be called x.

We shall then have

$$\frac{ma\,(R+r)}{ma\,(R-r)} = \frac{r+x}{r-x} \quad \therefore \quad x = \frac{r^2}{R}.$$

Thus the two forces, acting separately on A and B, are mechanically equivalent to a single force equal to 2 ma R, acting at R in the direction R R′.

Now, let us suppose two equal and contrary forces applied at C, each equal to 2 ma R, one in the direction C C′, and the other in the direction C C″. Since these forces neutralise each other, they will not affect the system, and are merely introduced to serve the purposes of the demonstration.

The system is then under the operation of the three equal forces here following:

1° —— 2 ma R acting in the direction C C′
2° —— 2 ma R acting in the direction C C″
3° —— 2 ma R acting in the direction R R′.

But the last two form a combination called in mechanics a *couple*.*

It is proved in mechanics that the effect of a couple depends on the direction of the plane which passes through its components and on its *moment*. This moment is the product of the force of the components and the distance between their directions. The distance between their directions in this case being x, and the forces being 2 ma R, the moment of the couple is

$$2\,ma\,R\,x = 2\,ma\,r^2.$$

Now, since all the couples which have the same moment and the same plane are mechanically equivalent, we may substitute for this couple another, of which the forces are $ma\,r$ applied at A and B in the directions A A′ and B B″. The moment of such a couple will be,

$$ma\,r \times A\,B = 2\,ma\,r^2,$$

and therefore obviously equivalent to the couple acting at C and R, for which it is substituted.

Let us now see the forces under the action of which the system is placed. They are as follows:

1° —— 2 ma R acting at C in the direction C C′
2° —— $ma\,r$ acting at A in the direction A A′
3° —— $ma\,r$ acting at B in the direction B B″.

The first acting at the centre of gravity C of the two masses A and B, will impart to the system an uniform motion of translation in the direction C C′ with the velocity ma, that is, the velocity with which C moved round O before the suspension of the central attraction.

The second and third acting at A and B with equal intensities, will have the same effect as the fingers would have applied to the opposite sides of a top or teetotum, causing the system to spin or rotate round C as a centre. The velocity with which A and B will move relatively to the centre C will be found by dividing the moving force $ma\,r$ by the mass, and will therefore be $a\,r$.

But that A and B should have the velocity $a\,r$, they must move in each second through an arc which is the fraction of the radius expressed by a. It follows, therefore, that the velocity with which the system would rotate round C as a centre, would be precisely the same as that with which it previously revolved round O.

Thus it appears that, by suppressing the central force which affected the system, two motions remain undestroyed, 1°, a motion of translation in the direction of the tangent

* *See my "Handbook of Mechanics," § 152, p. 42.*

* See my "Handbook of Mechanics," § 155, p. 4.

to the orbit at the point where the central action was supposed to be suppressed, with an uniform velocity equal to that with which the centre of gravity, c, of the system previously revolved round the centre of attraction, o; and 2° a motion of uniform rotation round c with such a velocity as to make one complete rotation in the time in which the system previously made a complete revolution round o.

Since it is evident that the mere suppression of the central attraction cannot have imparted to the system any forces or motions with which it was not previously affected, it follows that it must have had those two motions while the central force was in operation, and that its actual motion then resulted from the combination of the three.

If, besides suspending the action of the central attraction, the centre of gravity, c, of the system, be supposed to be at the same moment fixed, then the motion of translation will be arrested as well as that of revolution, but the motion of rotation will remain unaffected, and the system will rotate round c as a fixed centre, making one complete rotation in the time it previously made one complete revolution round o.

It may be here observed that the ideas on the subject of revolution and rotation recently put forth are not limited to the moon, nor to any other globe of which the time of rotation is equal to that of revolution. They are equally applied to and equally incompatible with all the conclusions of astronomers as to the rotation of the earth and the other planets.

All the difficulty which some persons have found in comprehending this question seems to arise from the several independent motions at the same time affecting the same body disguising each other. They do not, however, the less really exist. The tangential motion is disguised by its combination with the centripetal motion, and *vice versâ*, and both of these effects disguise the motion of rotation.

It is evident that the reasoning which we have here applied to the two connected masses, A and B, is, *mutatis mutandis*, applicable to all bodies placed on the surface of the earth, and sharing in its diurnal motion. All such bodies are, in fact, affected with a motion of rotation, as well as one of revolution, the former being imparted to them by their material connection with the earth. If the entire mass of the earth, except a mountain—the peak of Teneriffe, for example—were suddenly annihilated, the mountain would rotate on an axis parallel to the terrestrial axis, and the time of its rotation would be equal to that of the globe.

Mr. Symons ridicules *the idea of all bodies having this rotation, because, as he says,* "we all stand perfectly still side by side." I answer, that we do not all stand perfectly still, but are affected by a motion, one component of which is the very rotation in question; and the apparent "standing still" arises from this rotation being disguised by its combination with other motions.

Mr. Symons has complained that he has been met hitherto by mere assertions, instead of proofs. In the case of one who, like him, questions, or rather denies universally received principles, this is inevitable, especially in such brief and popular answers as alone can find a place in the newspapers and similar periodicals. I trust that he will not find this ground of complaint in the present article. I have assumed nothing that I am aware of, except the laws of motion, the universally-admitted properties of matter, and consequences flowing from them, which are found in all elementary works on mechanics and physics. If Mr. Symons denies these, there must be an end to all discussion on the subject, since he and those who admit the actual principles of mechanics will have no common ground to stand on, and no common principle to start from.

If I might presume to counsel him, I would, without meaning the slightest disrespect, suggest to an "Inspector of Her Majesty's Schools" to consider well his course before he perseveres in maintaining a proposition which all men holding any position of authority in the world of science pronounce to be a complete delusion.

If this article were designed for mathematicians and astronomers, an apology would be necessary for the very elementary details into which I have entered, and for the attempt at simplification which must be apparent in it. To have taken the problem in another form, and applied the inquiry to a globe revolving round a centre of attraction subject to disturbing influences like those which, as Professor Airy says, "pull about the moon," might have gratified vanity by a cheap display of mathematical gymnastics. But such a mode of dealing with the subject would serve no useful purpose. Astronomers and mathematicians alone would comprehend an article so written, and to them it would be needless, as they have no doubt on the question. To those who need to be convinced of the error of Mr. Symons's views, such an article would be unintelligible, and my only regret now is, that even what I have written, simple as it is, may be too technical for many who feel an interest in the question. I found myself unable, however, to treat the question conclusively in any more elementary manner.

DION. LARDNER.

Paris, July, 1856.

NEW METHOD OF PRESERVING WOOD.

THE *Journal of the Society of Arts*, of Friday last, contains a translated article on a new method of preserving wood, by Professor Apelt, of Saxony. "The method which I have adopted," says the Professor, "is new and original, not only respecting the *means* which I use, but also respecting the *principle* on which the whole process rests. I use the so-called sulphureous coal of Oppelsdorf, a peculiar coal, which is not to be found elsewhere, and which consists of finely-divided marcassite (Fe S^2, Fe S) for about two-thirds of its weight. This coal has, as I have found, that remarkable peculiarity of preserving wood by a simple process, which chiefly consists in allowing the sulphuret of iron in the coal to change into sulphate of the protoxide of iron. The *principle* on which my method rests, and by which it is chiefly distinguished from all others, consists in operating without any apparatus and without any expense for labour, simply using the process of *nature*, which gradually mineralises the wood, and removes the injurious influence of the soil. It is, therefore, the simplest and also the least expensive method that can be devised. The plan of working is as follows:

"The sulphureous coal of Oppelsdorf having been changed into 'vitriolic' coal, is brought into *immediate contact* with the wood about to be preserved, whilst the coal, by its hygroscopic nature, attracts the humidity of the atmosphere, and by its being exposed to the influence of rain, the sulphate of iron contained in the coal is dissolved, and penetrates slowly and gradually into the wood, and impregnates it. Thus the mere contact of the powers of *nature* achieves the process of impregnation with a metallic salt, which by any other method can only be performed by *art* and by the employing of certain fixed apparatus; and it is most remarkable that, according to this method, a power of nature, that is, humidity, is called upon to effect the preservation of the wood, which, under other circumstances, is the most injurious agent. But not only a *natural* impregnation is obtained thereby, but also the progressive mineralisation of wood, which is the chief point to be effected, a problem in *artificial* impregnation still unsolved. This may be proved theoretically as well as practically.

"The rot is produced by the tannin of the wood, which has a great affinity for oxygen, uniting with oxygen, and thereby forming 'ulmin,' the so-called efflorescent (mulm). This oxygen is introduced [illegible] like pine-timber, rots [illegible] by the humidity of the atmosphere. Now, if the penetrating fluid contains a solution of sulphate of iron, the protoxide of iron, which is changed at the same time by combining with the oxygen into oxide of iron, unites with the tannin of the wood to form gallate and tannate of iron, whereby the formation of 'ulmin' is prevented, and the rot rendered impossible."*

IMPROVEMENTS IN COATING IRON AND STEEL WITH ZINC.

MR. ALEXANDER WATT, the editor of the electro-metallurgical department of the *Chemist*, and whose skill in connection with electro-metallurgy is well known, has recently patented the following method of coating iron and steel with zinc:—He dissolves 200 ozs. of commercial cyanide of potassium in 20 gallons of water (rain-water or distilled water being preferable) in a suitable vessel. He then pours into this solution 80 ounces, by measure, of strong liquid ammonia (of the specific gravity of 880 by preference). Having stirred these compounds together, he places several large porous cells, such as those used in forming Daniell's batteries, in this solution, and pours into each of them as much of a strong solution of a cyanide of potassium (say about 16 ozs. to the gallon), as will be equal to the height of the solution in the larger vessel. He then attaches several pieces of metal (copper or iron by preference) to pieces of copper wire, which are then to be attached to the negative pole of a galvanic battery. These pieces of copper or iron are to be placed in the porous cells. He next attaches a piece or several pieces of zinc to the positive pole of the battery, and then immerses these pieces of zinc in the solution of cyanide of potassium and ammonia. The galvanic battery is now to be set in action, and allowed to continue in action on the above materials until the solution of cyanide of potassium and ammonia has taken up about 60 ozs. of zinc, that is to say, about 3 ozs. to the gallon of solution. As soon as the pieces of zinc have been weighed to determine the amount dissolved into the cyanide solution, he dips them into dilute hydrochloric acid, and then rinses them, when they are placed aside for future operations if necessary. The porous cells are then to be removed. He now dissolves 80 ozs. of a carbonated alkali

* This produces a decomposition of the metallic salt. The protoxide of iron is changed into oxide of iron, and penetrates in the cells in the shape of infinitely small crystals, imperceptible even under the microscope. This substitution causes the gradual agglomeration of these small crystals to take the original shape of the plant

(by preference the carbonate of potassa) in a portion of the above solution, and when dissolved adds it to the original solution, and stirs the whole together for a few moments, after which he allows the solution to stand undisturbed until the sediment formed has subsided. He then transfers the clear solution to another vessel, when it is ready for use. The articles to be coated are first plunged in a pickle composed of sulphuric acid, 1 lb.; hydrochloric acid, ½ lb.; water, 2 gallons; and this pickle removes any oxide of iron that may be upon them. They are then rinsed in clear water, brushed with a hard brush, sand, and water, and again rinsed in clear water, this pickling and brushing being continued until the whole of the oxide is removed. They are then placed in the solution above described, and connected to the negative pole of the battery. As soon as the articles are sufficiently coated, they are to be removed from the bath, and rinsed in clean water (hot water being preferable), and they may then be placed in saw-dust to dry them. The articles may be rendered bright either by means of the scratch-brush, or by gently scouring with silver sand and a soft brush.

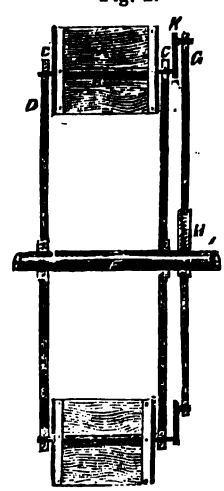
LEIGHTON'S FEATHERING PADDLE-WHEELS.

Mr. W. Leighton, of Newcastle-upon-Tyne, has recently patented the paddle-wheel represented in the annexed engravings, his object being to keep the floats always vertical, or nearly so, as in Miller's, Morgan's, and other wheels.

Fig. 1 is a side elevation, and fig. 2 a transverse section, of the paddle-wheel. A A

Fig. 1.

Fig. 2.



are the floats, each of which is attached to an axle, B, which is carried by bushes, C C, in the rims of the two wheels, D and E, which are fixed (as in the ordinary paddle-wheel) to the paddle-shaft, F; G is a third wheel, which is placed above the wheels, D and E, and mounted upon the grooved disc or sheave, H, firmly bolted by screw-bolts or otherwise to the vessel's side, and having formed in it, at I, the hole through which the shaft, F, passes. B B are the axles of the floats, and K K are the cranks by which the axles, B B, are connected to the rim of the wheel, G.

The action of this arrangement will be apparent to every mechanical person.

CORT'S NATIONAL TESTIMONIAL FUND.

We are highly gratified to find that the case of the descendants of Henry Cort, which we brought to the notice of our readers some months since, is assuming a very promising aspect. Steps have been taken to bring it before Parliament early in the next Session, and to well support it. Meantime subscriptions are added to the National Fund, and the press generally is rendering its aid. The *Times* of Tuesday last concludes a leading article thus: "Let any one think of our iron fleet, iron gun-

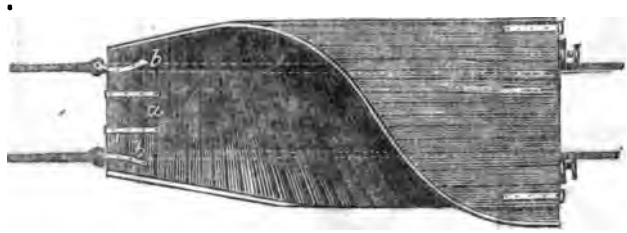
boats, iron mercantile marine, iron railways, iron engines, iron cotton mills, iron suspension and tubular bridges, iron batteries, iron palaces, &c., and then ask himself what should be the measure of public gratitude to the descendants of a man who endowed his country with such an amount of wealth and power. While others have, upon the strength of Henry Cort's discoveries, been raised to the position of millionaires, his children are almost starving. We should be ashamed for the honour of England to mention the amount of the pension which has been conceded to them by the Crown and Parliament. It is about equal in amount to the wages of a domestic servant of the humblest description, and even this has been made subject to deductions. For the sake of our national credit, it behoves all persons of influence in the country to give the case of Henry Cort's children their immediate consideration. In bringing the subject under their notice our duty is discharged."

The case of Cort's descendants is an exceptional one, and well deserves the consideration bestowed upon it.

GOVER'S RAILWAY SNOW-PLOUGH.

Mr. Charles Gover, of Lincoln, has recently invented a carriage or plough, running on wheels along the rails of a railway, for removing snow from them. The carriage is framed strongly together, and the fore part is constructed somewhat similarly to an ordinary plough. There is a horizontal cutting edge of a length somewhat greater than the space between the rails, in order that the snow may be removed not only from the over space between rails, but also on either side of the two rails. There is also an upright cutter in the nature of a coulter, and a mould-board. The two cutters divide the snow horizontally and vertically, and the mould-board turns over the snow at a distance from the rails.

The engraving shows a plan of the snow-



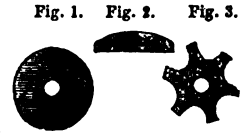
plough complete. *a* is the horizontal cutter or share; *b b* are two side cutters or coulters; and *c* is the mould-board. The shape and framing of the parts of the carriage, and the mode of putting the parts together, may be varied.

CHESTERMAN'S JOINT-SPRING.

Mr. J. Chesterman, of Sheffield, has recently introduced a very excellent form of spring, especially applicable to the joints of knives, razors, scissors, and other like articles. It consists of a disc or discs of steel or other suitable metal made concave. This concave disc rests upon its edge in a countersunk bed, or upon a plane surface, and being confined, as for instance, by a rivet between two handles or "scales" and the end of the blade of a knife, exerts a constant pressure sideways against the blade in endeavouring to regain its original shape or form. The edge may be hollowed out in parts, if desired, as the action of the spring depends upon its concave form; and, except for *heavy pressure, it is not* necessary that it should have a bearing upon every part of its edge or base.

Fig. 1 is a plan of such a disc; fig. 2 is a transverse section of the same; fig. 3 is a plan of one in which the edge is hollowed

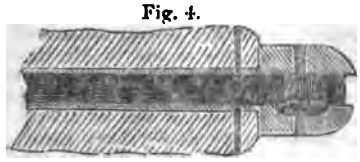
Fig. 1. Fig. 2. Fig. 3.



out in parts, as before mentioned; fig. 4 is a longitudinal section of a portion of a knife to which the spring is applied taken at right angles to the plane in which the blade moves when opened and closed. In conjunction

with the improved spring, Mr. Chesterman sometimes introduces into the knife a spring with a projection upon its end for locking the blade when open. This spring has con-

Fig. 4.



nected to it a stud by which it is drawn back when the blade is to be closed, and pushed forward so as to act as a wedge between the back of the shoulder of the blade and the back of the knife when it is open, and thus lock it.

The improved spring makes a very smooth and easy joint when applied to rules, compasses, callipers, &c.

GRAY'S AZIMUTH AND AMPLITUDE INSTRUMENTS.

Mr. Gray, of Liverpool, whose marine compasses were described at page 433 of our 62nd volume, recently obtained provisional protection for a method of arranging azimuth and amplitude instruments in connection with ships' binnacles, or compasses, in the following manner. On the top of the binnacle shade a short metal cylinder is fixed, which has at the upper end a glass disc divided round its circumference into 360°. These divisions will be rendered visible at night by a lamp in the binnacle. On the upper end of the metal cylinder a revolving ring is applied, which carries a standard to which a telescope is jointed, so that it can be elevated or depressed at pleasure. Opposite to the telescope a mirror is fixed, at an angle of 45° from the vertical, so that when the telescope is placed horizontally it looks into the mirror, which reflects the divisions on the glass circle. When an observation is to be taken, the glass circle is set to correspond with the binnacle compass, and the object is viewed through the telescope, which is then placed horizontally, and the angle on the glass circle read off. There is a line drawn on the mirror to render the reading more accurate.

INTERNATIONAL CONGRESSES AT BRUSSELS.

Some confusion seems to have arisen from the circumstance that two international congresses are shortly to be held at Brussels; the one for improving the physical and intellectual condition of the working classes, to be opened on the 15th September; the other for promoting the principles *of free trade, to be opened* on the 22nd of the same month. The latter is intended to bring together documents of every kind tending to elucidate the manufacturing and commercial economy of nations, especially in relation to their mutual intercourse. The other is intended to induce a better knowledge of the actual condition, wants, and resources of the industrial population in various countries, and to encourage the adoption of the most practical means for improving their health, comfort, and intellectual development. With this view it will be connected with an exhibition of articles of domestic and sanitary economy, which is to be opened on the 25th August, and to be closed on the 5th October. The exhibition will, it is hoped, lay the foundation of a permanent Economic Museum. A committee has been appointed by the Statistical Society of London in aid of the Brussels Philanthropic Congress, while the Society of Arts has similarly undertaken the furtherance of the Economic Exhibition.

CLAYTON'S PATENT BRICK MAKING MACHINE.

In noticing this machine, in connection with the Chelmsford Exhibition, *Bell's Weekly Messenger* says: "The appearance as well as the novelty of this machine (being the first time it has been exhibited at the shows of the Royal Agricultural Society of England), created considerable attraction and deserved attention. The judges and engineers engaged on the occasion, accompanied by the stewards, were in attendance on Monday morning, to test the capabilities of this machine (the exhibitor of the other machine referred to declining, for some cause, to put his machine in competition), which was worked by one of Clayton and Co.'s small portable steam engines. The machine was subjected to *two* trials, the first having reference to the power required, and the second to the productive capabilities of the machine. The result was highly satisfactory, the machine producing the extraordinary number of 210 bricks in five minutes, or at the rate of 25,200 bricks per ten hours' working; the machine during this trial was attended to by only two men and two boys. The result of the working, the regularity of operation, and the quality of the bricks produced, appeared to astonish everybody present. The judges very properly awarded their prize to this machine. We may observe that Mr. Clayton received the gold medal of honour at the Paris Exposition for his brick-making machines. The machine was worked at intervals during each succeeding day of the show, and formed one of its most novel features."

FOREIGN INTELLIGENCE.

Scientific, Engineering, Architectural, &c.

GREAT FEAT OF DUTCH-DYKE ENGINEERING.—A proof that the old water engineers have not lost caste has been given by the immersion of a wickerwork 110 yards long, 45 yards broad, and presenting a surface of nearly 1½ acres, a work never yet accomplished even in Zealand. It was sunk at the Wilhelminen Polders on Sud-Beveland, for the protection of the dyke endangered last spring, under the direction of M. Conrad, engineer of the water works of the State. There were used 90,000 bundles of broom, and 500 cubic yards of coarse stuff for holding them together; 250 tons of Vilvoord stones were used as a ballast.*

NOVEL INVENTION OF SHAWL PRINTING.—It is known that the present method of impressing designs on shawls is an expensive one, as it is performed by *single* plates. For producing, say, 200 shawls a day, 100 workmen, 100 children, and an area of 300 *mètres* are required. Mr. J. Bassi, a manufacturer of Vienna, has of late devised a new plan, which will make the cheaper sort of this favourite female vestment accessible to most people. Mr. Bassi can produce in a day (of ten working hours) thirty shawls, printed in ten colours, with the mere aid of one man and one juvenile assistant, who require hardly any space for their work. His invention has already been tested by several manufacturers, and is spreading fast over Germany. The price of labour in producing (impressing) shawls is thereby diminished 2,000 per cent.

RUSSIAN SUBMARINE SHIPS.—Although a *glorious* peace (to all parties) has been concluded, the Russians continue to prepare for emergencies. Very successful trials have been made of late at Cronstadt with a submarine vessel, which can be lowered to the depth of about twenty or thirty feet below the surface of the water. At the trials alluded to, the ship remained a considerable time under water, so long indeed that an account of the experiment was written on board in the meantime,—the first writing ever done under water.

[*Communicated by* DR. J. LOTSKY.]

Prize Essay on the Prevention of the Smoke Nuisance. By CHARLES WYE WILLIAMS, Assoc. Inst. C.E. London: John Weale, 59, High Holborn. 1856.

THE announcement by the Society for the Encouragement of Arts, Manufacture, and Commerce, of their intention of giving prize medals for the best essays on the prevention of smoke, brought many competitors to the field. The first prize was finally awarded, as we have already announced, to Mr. Williams; the second to Mr. Charles Hood, F.R.S. The former essay is now before us, in a neat and accessible form; we trust the latter will also be printed by the Society. We should have been surprised had the first prize fallen to any other individual, considering the long and laborious pursuit of the subject by the successful competitor, and the peculiar opportunities enjoyed by that gentleman in connection with it. Mr. Williams has the merit of having been the first to apply steam navigation to trading purposes. In 1823 he had the first two vessels built to ply, winter and summer, between the ports of Liverpool and Dublin. This beginning ultimately merged into the "City of Dublin Steam Company," under his sole management. In the year 1841 he was also the leader in the formation of the "Transatlantic Steam Ship Company," which, after three voyages to New York were performed under their auspices, transferred their two vessels, the *Great Liverpool* and the *Oriental*, to the now Peninsular and Oriental Steam Ship Company, of which Mr. Williams was one of the first directors.

With these peculiar opportunities, Mr. Williams became early aware of the necessity of a thorough examination of the subject of combustion, the use of coal, and the best construction of boilers, as the great elements of success in steam navigation. His dissatisfaction with the system then adopted, and his conviction of the necessity which existed for a scientific as well as a practical inquiry into the subject, is fully described in the introduction of the first edition of his treatise "On the Combustion of Coal, Chemically and Practically Considered," published in 1841. The economy of fuel and the best system for the construction of boilers and furnaces becoming thus to him a matter of business, induced him, in 1839, to take out a patent for what he called the "Argand furnace," from the similarity in principle with the lamp and gas-burner of that name.

The readers of this Magazine have been familiarized with the subject by the numerous valuable contributions from the pen of Mr. Williams, during the last fifteen years, which now appear concentrated in the essay under consideration. In Mr. Williams's case we have an important illustration of the value of competition, and of the exercise of talent, ingenuity, and investigation which it induces. Without this impulse, neither of these essays would have

* *Could not the Goodwin Sands be mastered by such a huge apparatus?—J. L.*

been produced. Had the home Government taken measures to bring scientific and practical competition into the field, before entering on the doubtful expedient of passing an Act of Parliament to compel manufacturers under pecuniary penalty to study chemistry, they would have avoided the vexatious and even discreditable results of their efforts to carry out the present Act, 16th and 17th Victoria.

Although the engineering world, and men of great practical experience, were still at issue, not only as to the means of preventing the issue of smoke, but even, as has recently appeared, as to what it really consisted of, the Government nevertheless passed an Act rendering it compulsory on all parties to "*burn the smoke*," before they had ascertained whether such was chemically or practically possible. The essay under consideration has unquestionably established the necessity for such a preliminary inquiry. Strange to say, the same erroneous course is still followed, in opposition to science and practice; for a further Bill has already been passed, not certainly for the amendment of the former, but for bringing beneath its ambiguous provisions a branch of manufacture which had previously been exempt from them. We do not, of course, complain of parliamentary action in the matter, but of the want of skill and care with which the instrument was framed.

Following the conditions laid down by the Society of Arts (which, by the way, we do not consider the most eligible for drawing out the information required, and which has led to unnecessary repetition, of which Mr. Williams to some extent complains), the essay examines the subject under the following heads, viz.—

1. Generally, on preventing the smoke nuisance.
2. Of the plans put forth as remedies.
3. Of those which are designed to burn smoke by bringing it into connection with *incandescent* fuel.
4. Of those which rely on the use of hot air.
5. Of mechanical appliances.
6. Of giving due attention to the introduction of atmospheric air.
7. Of the expense or economy of the proposed plans.
8. Of the nature and properties of smoke.
9. Of the practical application of the principles explained, and the proposed remedial measures.
10. Of legislative measures.

We propose taking a brief notice of each of these heads.

Section 1 takes a general view of the subject, and the prevailing misapprehension that, to abate the nuisance of smoke, it is necessary that the latter should be "*burned*," notwithstanding the absence of proof that it is a combustible body, and complains of the Metropolitan Act peremptorily requiring that "every furnace shall be so constructed or altered as to *consume or burn the smoke* arising from such furnace." This, Mr. Williams asserts, is a "condition which, practically, involves an impossibility; and, chemically considered, is at variance with all authority, and incapable of proof;" hence inferring "the necessity of examining the subject scientifically, and *pari passu* with that of its practical application, since we cannot make a single step in the practical inquiry except by the aid and in conformity with chemical laws, which, in this case, are the mere expression of the processes of nature." On this necessity Mr. Williams relies, as justifying those chemical details which run through the entire essay.

Mechanical men, in whose department the construction of boilers and furnaces has hitherto rested, have certainly not given this scientific view of the subject much consideration. Mechanics and chemistry do not necessarily imply any connection or mutual dependence. When, however, it is considered that the construction of a furnace involves the combustion of the fuel employed, and that combustion, with its conditions and processes, forms an important and difficult branch of chemistry, no one can resist the conclusion that a furnace should be treated as a mere vessel or alembic in which certain chemical processes are to be conducted in obtaining certain chemical results. Concurring in this view of the subject, we at once exonerate the author of this Essay from the charge or imputation of gratuitously thrusting scientific details on the attention of mechanical engineers with whom the construction of furnaces and boilers rests. Not only has he acted wisely in introducing them, but he could not have omitted them without injury to his undertaking.

The observations of His Royal Highness Prince Albert, in his address at Birmingham, on the connection between Science and Art, are here appropriately referred to, where it is observed that "In all our operations, whether agricultural or manufacturing, it is not *we* who operate, but the *laws of nature* which we set in operation. It is, then, of the highest importance that we should know those laws in order to know *what we are about*."

With those laws of nature which control the process of combustion, and influence the operations of the furnace, the subject is intimately connected. Science has shown that the black cloud called smoke, instead of being homogeneous, or a mere body of

unconsumed carbon, consists of both solid and gaseous, simple and compound bodies, the constitution of which, even within our recollection, was but little inquired into, at least by mechanical engineers.

The essay next refutes the theory that smoke is necessarily formed in the furnaces and proceeds direct from the coal on its being heated, as is insisted upon by many. This at once opens the question of the difference between the *gas*, and the *smoke* of coal.

An elaborate paper was read not long since before the Society of Arts, by Mr. Muir, of Glasgow, which professed to examine the subject "morally, historically, scientifically and practically."

This paper is referred to by Mr. Williams as an example of the prevailing doctrine of the day, as to the "burning of smoke;" and no doubt the writer of that paper exposed himself to the censure which has been passed on several of his statements by Mr. Williams. Nor was Mr. Muir justified in dogmatically assuming to be the mouthpiece of either scientific or practical men. His peculiar views are not in unison with those of either class, and he was doing violence to the judgment of professional men by placing his own views in the style adopted by him before such an assembly as the Society of Arts, and by assuming to be the exponent of public opinion.

The main practical error of the present day, is shown, in the essay, to consist in mistaking or overlooking the difference between gas and smoke, and then insisting, that as the former is a well-known combustible, and may be employed as a source of heat, so may the latter also. This error is shown to be the source of those deviations which have led many smoke-burning patentees away from the true object of inquiry, and the legitimate means of preventing the nuisance. Indeed no reader of this Magazine can doubt that this error still prevails, for new patents continue to be announced almost weekly, for modes of consuming, not the *gas*, but the *smoke* of coal.

Section 2 examines "the various plans that have been put forth as remedies" for the smoke nuisance. This involves an examination "*scientifically* considered, in reference to their respective merits; and *practically*, as to the results of their application." In examining the numerous plans, the essay speaks of the absence of reliable data, and, perhaps rather severely, comments on the supposed intention of patentees misleading the public with the view of extolling the merits of the respective patents.

Section 3 treats of the plans which insist on the burning of the gas or smoke of coal, by means of a body of hot fuel. These are entitled to, and receive particular attention, as they are based upon the principle relied on by many recent patentees; namely, the causing the smoke to be heated by, or to impinge on the incandescent fuel in another furnace, or another part of the same furnace. On the supposed efficacy of this operation the celebrated James Watt based his patent of 1785. The essay goes to show the error on which this theory of Watt is founded by pointing out that combustion, either of the gas or the coke, is a self-continuing process, and requires no extraneous heat. This point appears conclusively established by the facts and reasoning adduced. Of the continuous character of flame and combustion some striking proofs are given, showing that when once combustion has commenced no further, or *extraneous* heat is necessary—each atom of gas, during its combustion, providing the heat necessary for that of the succeeding atoms, thus making the process *continuous*, if the due supply of air is provided and brought into contact with the atoms as they thus become heated to the temperatures required for chemical action or combustion.

The supposed necessity for bringing the flame, gas, or smoke, into contact with a body of incandescent fuel, is thus shown to be a great practical error, the combustible matter really requiring *air*, rather than *heat*. The result of contact with red carbon is stated as tending to deceive the observer, by the formation of invisible carbonic *oxide* gas, and so far from being economic, is a wasteful expenditure of the additional carbon which the carbonic *acid* takes up, in the formation of that gas. On this point the author refers to his treatise on combustion, where the formation of *carbonic oxide*, and its action in the furnace, are more fully enlarged on. This is a subject of great practical importance, inasmuch, as patentees are too often deceived by appearances, and are led to believe they have effected the combustion of smoke, when in truth they have only rendered the black carbon or colouring matter invisible, by its union with the carbonic acid issuing from such incandescent coke or red hot cinders.

The essay next points out briefly the objects which the heated red mass of fuel in a furnace really has to effect. These are, first, the effecting of the continuous generation (we think expulsion a more expressive term), of the volatile constituents of the coal from each fresh charge. Secondly, the effecting of its own combustion by the air received from the ash-pit.

(*To be continued.*)

FLYING BY MAN.

To the Editor of the Mechanics' Magazine.

SIR,—Not being acquainted with the meshes of English (Patent) Law, through which, according to Brougham, a man may drive a coach-and-four, I am doubtful, whether by publicly starting and thus discussing a *patentable* subject, I may not forfeit my right to patent it. However, there are bounds to what a nation would *not* suffer, and thus I will go on fearlessly.

My invention, referred to in my letter in the *Mech. Mag.* of July 19th, may, in some part, be called a *communication*. Because, there *really* was a man *flying*, that is, lifting himself from the ground and directing his movements, about the year 1802, in Germany. But the excitements of the Revolution and the great wars prevented the invention from being followed up. Besides, there are inventions which out-wing, or outfly the *pre-ordained* time for their development, and then they can and will not *take*. Don Quiros wore out many pairs of shoes in inducing the Spanish ministry (about 1628) to colonize *Terra Australis*; the watchmaker, Cohen, melted gold in 1834, but it was not until 1847 that "the five confederated provinces" had to become a gold land! Thus "everything is ordained in time, number, and quantity."

Considering what *flight* the English nation as *such* is taking in every sense and respect, that outcry in a nobler sense, "*Panem et Circenses!*" shouted a thousand times,—the establishing of the Crystal Palace, the Giant Hall in the Surrey Gardens, the preparations at the Colosseum, &c., all point at that the nation pants after instruction, in-formation, *re-creation!* And it is a great period in the life of a nation, when it awakens and says, "*We* also are human beings—*we* also want re-creation!" And nought will satisfy a nation thus impelled, until all and everything, educational, artistic, literary, technical, &c., is accessible to it; not for becoming *savants*, teeming with learning, but a *people*, who know their dignified and sovereign position in the scale of society, and are willing to occupy it. Thence, it will become necessary to afford such a people the sights and re-creations which any of our advanced branches of knowledge or art may be able to afford.

Amongst these, the *flying by man* would surely rank high. The apparatus even which I propose, is of an imposing character, as the wings or flaps by which the German aeronaut elevated himself, had a diameter of twenty feet; a powerful surface, therefore to move and to expel air, to create a *vacuum*, &c.

These considerations lead me to the fact, that even the flying of birds is not yet scientifically explained and accounted for. I shall adduce an example. During my late pedestrian journey through Germany, a large stork towered once above my head, and remained thus gyrating around my zenith for some time. As my vision is very sharp, I carefully observed his movements. When the bird was, as it were, *gliding* (*planer* in French) through the air, there was no movement (flapping) of his wings, but I saw most accurately that the large feathers of his wings (*pennæ remiges*) were turned out of their natural *horizontal* position into a *vertical* one, so that I could see the air or light through the interstices thus formed. This presupposes a number and variety of small muscles in the forearm (ante-brachial) of the wing, probably not even known and described, as with the smaller birds, they must be threadlike, or even much less. Then, there are the large *air*-cavities in the bones of birds, the air within these being much rarified by the high temperature of this class of animals, &c. These arrangements will probably have to be imitated, and in doing this great difficulty may be experienced. Then, speak of an ærial ship to fly to Calcutta! Why, we shall have plenty of work to fly to Norwood!

I am, Sir, yours, &c.,

J. LOTSKY.

15, Gower-street, July, 1856.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

RICHARDS, W., and J. R. COOPER. *An improvement or improvements in breech-loading fire-arms.* Dated Dec. 3, 1855. (No. 2718.)

Claims.—1. The method described of opening and closing the breech end of muskets and other fire-arms, by giving the barrel a sliding motion in the direction of its axis, and making the open breech end of the barrel bear against a fixed conical bearing, by which the breech end is closed, the sliding motion being effected by arms or levers, having curved slots eccentric to the centre of motion, which slots engage with pins or studs on the sides of the barrel, the barrel being also capable of turning aside out of the line of the lock and stock of the fire-arm for the purpose of loading. 2. The method described of opening and closing the breech end of fire-arms, by dividing the barrel transversely into two parts, the anterior part being fixed, and the posterior part made to turn on a centre, so as to have motion in a vertical plane, and also capable of a sliding motion in the direction of the axis of the first portion of the barrel, the

said motion being effected, and the moveable part of the barrel made to engage with or bear against the fixed part of the barrel, by means of a wedge, actuated by an arm or lever underneath the stock. 3. An adjusting wedge described for accurately determining the bearing of the moveable portion of the barrel against the fixed portion of the barrel.

ROWAN, W. *Improvements in steam engines.* Dated Dec. 3, 1855. (No. 2719.)

An illustrated description of this invention formed the first article in our Number for July 19, No. 1719.

WATT, A. *An improvement in coating iron and steel with zinc.* Dated Dec. 3, 1855. (No. 2721.)

This invention is described on page 104 of this Number.

GARN, S. *An improved tipping apparatus applicable to carts and other vehicles.* Dated Dec. 4, 1855. (No. 2723.)

This apparatus consists of an upright brace and sword, with regulating holes and pin, acting on a lever actuated by a suitable handle or handles, so as to enable the driver of the vehicle to which it is attached to tip the body of the same, from before or behind with facility, and regulate its angle of inclination.

HARTCLIFFE, W. *Certain improvements in weighting the top rollers of machinery used in preparing and spinning cotton and other fibrous materials.* Dated Dec. 4, 1855. (No. 2725.)

This invention consists in the application of anti-friction rollers to the weight-hooks and saddles bearing on the top rollers of the drawing rollers, forming part of the above named machinery.

FOOT, W. *An instrument for moving and stopping trucks and other carriages on railways.* Dated Dec. 4, 1855. (No. 2726.)

A lever or bar, by preference of wood, has fixed at one end a forked instrument formed so that one prong comes on one side of the ring or felloe of the wheel, and the other on the other side of it, near where the wheel is resting on a rail. One fork is bent or projects inwards, so as to come on the inner surface of the wheel. By the use of this instrument, when the lever or handle is lifted, if the prong be at that part of the wheel which is resting on the rail the wheel will be caused to turn, and the carriage will move in a direction away from the instrument; whilst, on the other hand, if the handle or lever be depressed on to the rail the wheel will be stopped.

BARLING, J. *An improvement in the manufacture of paper by the application of a root not before used for the purpose.* Dated Dec. 4, 1855. (No. 2727.)

This invention consists in the application of the roots of the hop plant to the purpose of paper making; also, in certain means of preparing such roots for paper making purposes by cleansing, drying, and storing the same, and in boiling such roots in an alkaline solution to soften them, and extract therefrom the colouring and other matters.

DAVOUST, J. *Improvements in cartridges.* (A communication.) Dated Dec. 4, 1855. (No. 2728.)

The object of this invention is to increase the range of fire-arms when firing shot, and the invention consists in placing the shot in a capsule formed of strong paper, closed more or less at its mouth according to the range which it is desired to obtain, and over this mouth a piece of thin paper is pasted or tied. To the rear end of the capsule is attached a disc of calico or other fabric which guides the capsule in its flight, while the shot is escaping. This disc of calico is folded up and packed into a hollow wad.

MARSH, J. *Improvements in the manufacture of looped and pile fabrics.* Dated Dec. 4, 1855. (No. 2730.)

These improvements consist in adapting certain parts to single-tier bobbin-net machines, for the purpose of producing new descriptions of work. The principal features of novelty consist—1. In the use of four point-bars instead of two; and 2. In looping the pile-threads to only one shuttle-thread or bobbin-thread, that is to say, two of such said point-bars are used for taking up the pile-threads; for which purpose one is placed at the front of the machine, and the other at the back, and the other two are employed for taking up the weft-threads after they have passed through the warp and pile-threads, and by thus using the aforesaid point-bars, the patentee is enabled to hold the last made row of loops and the weft-threads firm during the forming of the next row of loops, and the passing of the shuttles or bobbins through the warp-threads or pile-threads for fastening them together; so that by the use of the two aforesaid additional point-bars the loops may be held in a somewhat similar manner to that in which the weaver's wire holds the loops while the pile is being cut, and the wire put in the pile-shed, and the shuttles or bobbins pass through the warp-threads to fasten them together.

BULLOUGH, A. *An improved lubricator for looms.* Dated Dec. 5, 1855. (No. 2731.)

The patentee fixes at each side of the frame of the loom a bracket, on which he places a small vessel with a projecting tube. In this vessel he puts the lubricating matter, and passes through the said projecting tube some absorbent conducting material, one end

of which must be in contact with the matter in the vessel, and the other projecting a little out of the end of the tube. At every forward movement of the slay the material projecting from the tube will touch the shuttle box-spindle.

MOFFAT, J. *An improvement or improvements in the manufacture of metallic spoons, forks, and ladles.* Dated Dec. 5, 1855. (No. 2732.)

This invention consists in preparing tapering strips of metal from which blanks are to be cut. These blanks are to be made into spoons, forks, and ladles by means of certain rolling machinery described. Also in planishing spoons, forks, and ladles, or their handles, by means of rolls having highly-polished surfaces, and an alternating or rotary motion, as described. Also by means of rolls having the form of semi-cylinders or other portion of a cylindrical surface, and having an alternating or rotary motion.

PLUNKETT, W. G. and J. BOWER. *The manufacture of fibres or threads for textile fabrics and cordage, also of paper, mill-board, and other similar boards, from plants or portions of plants not hitherto used for these purposes.* Dated Dec. 5, 1855. (No. 2733.)

This invention consists in the application to such manufactures of the yellow flagger, the woolly-headed burdock, the common coltsfoot, and the red or white beet or mangold worzel.

NUNN, W. *An improved table, washstand, mirror, &c., combined in one piece of furniture.* Dated Dec. 5, 1855. (No. 2734.)

The patentee attaches a mirror of sufficient size to show the whole of the human figure to a table, the upper part of the mirror appearing sufficiently above the table to answer the purpose of an ordinary dressing-glass, and by the arrangements of the table in parts he removes, by various means, the parts of the table from before the mirror, or by means of slides, hinges, screws, &c., he draws the mirror from behind the table when required to see the whole of the figure. He also makes the table with a drawer which contains a wash-basin with valves, cocks, pipes, &c.

FELL, T. M. *An improved ships' cooking and distilling apparatus, and improvements for the production of fresh water from sea or salt water.* Dated Dec. 5, 1855. (No. 2735.)

The patentee introduces a contrivance of heated flues and evaporating and condensing chambers whereby the heat produced by the combustion of fuel is communicated direct to the ship's ovens or pots, or immediately to the distilling portion of the apparatus.

BEATSON, W. *Improvements in treating borates of lime and magnesia, and a new composition formed therewith, suitable for glazing and other purposes for which borax has been or may be employed.* Dated Dec. 5, 1855. (No. 2736.)

This invention consists in heating or fluxing the borates of lime and magnesia along with carbonate of soda (either dry or in crystals), or with sulphate, muriate, or other salt of soda in a furnace, and heating the fused mixture to a red heat. The resulting borax or borate of soda is dissolved and crystallised in the usual way. Also, in treating, by boiling or otherwise, the mineral borate of lime and magnesia with ammonia or potash, or the carbonate, sulphate, or other salts of the said alkalis. Also, in treating the borates of lime and magnesia (by boiling or otherwise) with sulphate or muriate of soda, either alone or (which is preferred) along with a small proportion of ammonia, or with the sulphate or other salt of ammonia.

HEILMANN, C. *Improvements in grates or furnaces for steam boilers.* Dated Dec. 5, 1855. (No. 2737.)

This invention consists in the combination of a set of horizontal grate bars placed one below the other, the lower bars projecting beyond the upper ones to form an inclined surface, and a horizontal set of grate bars with a hopper furnished with a sliding door to regulate the admission of the coal, and a fire-brick arch over the grates to promote the combustion of the coals. Also, in contracting the opening of the flues to unite the products of combustion as they pass from the grates.

SMITH, W. H. *An improved construction of fastening, applicable to gaiters, stays, and other like articles.* Dated Dec. 5, 1855. (No. 2739.)

Instead of using, as in his old stay and gaiter fastening, patented in 1845, two boxes or studs, one at either end of a strip of metal, to receive the ends of a second or elastic strip, which is bowed (to shorten its length), and then sprung into its place, the patentee now proposes to use one box or stud to receive the lower end of the elastic strip, and for securing the upper end, employs a box-catch.

NEWTON, A. V. *Improvements in apparatus for dressing cloth.* (A communication.) Dated Dec. 5, 1855. (No. 2740.)

This invention relates to the employment of metallic teazles of a peculiar construction. The patentee is thus enabled to dress woollen cloths in a transverse direction.

MARLAND, J., and S. MARLAND. *Certain improvements in power looms.* Dated Dec. 6, 1855. (No. 2741.)

This invention consists in the application

of helical or worm springs, acting by compression, to the production of the necessary amount of contact and adhesion betwixt the taking up beam or roller and the cloth beam. It also embraces an arrangement for regulating the tensions in the warp.

WILSON, W. G. *A pneumatic moderator.* Dated Dec. 6, 1855. (No. 2743.)

This invention consists of a balance valve working in a frame suitable for being fitted into a flue, chimney, or shaft. The moderators or valves, while neutralizing the effect of down draught, allow of the free passage of smoke and heated or foul air up the flue in which they are placed, and also of the flue being swept.

MOSLEY, W. *Improvements in machinery or apparatus for stretching and finishing woven fabrics.* Dated December 6, 1855. (No. 2744.)

These improvements relate to a method of treating woven fabrics upon the principle of calendering. Top and bottom rollers, having right and left-handed spiral channels or grooves formed upon their peripheries, when revolving, cause the cloth or woven fabric to be stretched, and from their reciprocating motion, the cloth may be finished and receive a lustre to the required extent.

PAGET, A. *Improvements in machinery or apparatus for the manufacture of looped or other fabrics.* Dated Dec. 6, 1855. (No. 2745.)

Claims—1. An arrangement of machinery or apparatus for making cylindrical web, in which the inclines, cams, or their equivalents, which actuate the needles, sinkers, or presser, are made to revolve. 2. The employment of a ring presser, the inner periphery of which rolls on the outer periphery of the needles. 3. The application of conical bearings to keep the revolving parts of the machine concentric with the stationary parts. 4. An arrangement for driving the machine by an endless belt or band, the slackening of which suspends the motion of the machine. 5. The employment of apparatus for winding or rolling up web or other fabric, in which a weight sliding along a lever imparts torsion to the axis of the roll of web, or other fabric, such torsion increasing with the increasing diameter of the roll.

CHAFFER, T., and J. ELLIS. *Improvements in machinery for sawing and cutting slate, stone, coal, salt rock, or other minerals.* Dated Dec. 6, 1855. (No. 2751.)

This invention is applicable to sawing or cutting blocks from the quarry, and consists —1. In sawing seams into minerals, by means of a circular saw, which travels along a bed plate fixed to the mineral to be operated upon. 2. In causing a cutting tool to *move to and fro* along a bed plate, and in so *moving it as to cut a seam into* the mineral, the said cutting tool being made to increase the cut by means of a setting-up screw or other mechanism.

NEUENSCHWANDER, J. *Certain improvements in the process of preparing what is called "Swiss whey" from milk.* Dated Dec. 6, 1855. (No. 2752.)

Claims.—1. The boiling or concentrating of the whey after it has been cleared of the curds, after the second process of curdling. 2. The boiling or concentrating of the whey when drawn off into corked or uncorked bottles or jars.

BODMER, R. *An improved planimeter.* (A communication.) Dated Dec. 6, 1855. (No. 2753.)

This planimeter, to be called the "polar planimeter," is intended to measure the area of figures of every description. It cannot be described without engravings.

CRAMPTON, T. R. *An improvement in furnaces, and in apparatus for supplying fuel thereto.* Dated Dec. 6, 1855. (No. 2754.)

This improvement consists in constructing a furnace with openings on the level of the upper surface of the fire-bars, in order that the fuel, as it is forced through the openings into the furnace, may pass along the fire-bars and raise the ignited fuel above. An important feature of the invention consists in the application to locomotives of an independent steam engine (which may or may not have a feed-pump attached) to give motion to any fuel-feeding apparatus.

PERKINS, A. M. *Improvements in apparatus for generating steam.* Dated Dec. 6, 1855. (No. 2755.)

In this invention the circulation of water is employed to heat and evaporate successive quantities of water which are forced into one of a series of vessels (surrounding the water-circulating pipe), by means of a plunger worked by steam generated in the apparatus. The system of circulating water which is used, is that well known as Perkins' system, wherein the circulating water is hermetically closed within tubes, leaving space only for expansion.

THOMAS, F. S., and W. E. TILLEY. *Improvements in producing aluminium and its alloys, and in plating or coating metals with aluminium and alloys composed of aluminium and other metals.* Dated Dec. 6, 1855. (No. 2756.)

The invention consists in depositing the metallic base of aluminia, or aluminium, by electric currents from a certain described solution of aluminia, with or without other metals, and in plating or coating metals with aluminium and alloys composed of aluminium and other metals.

PERKINS, A. M. *Improvements in warming buildings and apartments by hot water.* Dated Dec. 6, 1855. (No. 2757.)

This invention consists in warming apartments by means of an ordinary hot water apparatus, combined with a high-pressure apparatus, or apparatus in which water circulates in closed pipes, and these apparatuses are so combined that the coil of the high-pressure apparatus enters into and heats the water in the boiler of the low-pressure apparatus.

KUISTER, J. J. E. F. *Improvements in raw silk winding machinery.* Dated Dec. 7, 1855. (No. 2758.)

This invention consists—1. In rendering the attendant's work far easier by allowing her to be seated, and causing the moveable apparatus to come up to her at her own will, and bring the skeins forwards. 2. In speeding the work by making use of light circular frames instead of hoops in order to lessen the resistance to the traction of the bobbin, and to spare the silk thread. 3. In effecting the same work in a narrower space. 4. In preventing much waste by rendering it easier to find out the broken ends. This is attained by applying the circular machinery to winding off raw silk, with some necessary modifications, which means constitute the invention.

HART, H. *A ship-leakage indicator.* (A communication.) Dated Dec. 7, 1855. (No. 2760.)

This apparatus is furnished with a float, which works up and down in a shaft or case which reaches to the bottom of the ship, or nearly so, and to the bottom of which shaft or case any leakage water within the ship has free access. To the float is connected a pointer, which moves round a dial.

GARDNER, J., J. C., and H. *Improvements in glasses as applied for the transmission of light.* Dated Dec. 7, 1855. (No. 2762.)

This invention consists in the use in the ordinary way over the light (gas or otherwise, as the case may be), for increasing its illuminating power, a solid piece of glass having a cylindrical, elliptical, or other bore or opening through or near the centre for the light, such glass being externally more or less globular in form. Also in the use of hollow glasses filled with water or other transparent fluid.

LENNY, C. *Improvements in carriages.* Dated Dec. 7, 1855. (No. 2764.)

This invention consists—1. In causing the folding top to throw back in the usual manner, but to include with it the front portion also, so as to render the opening or closing of the whole top of the carriage one operation, whilst the side, front, and centre pillars are rendered movable by means of hook-hinges, the windows remaining in the doors or body of the carriages when employed as open ones. 2. In giving motion to the steps of carriages, through the intervention of the carriage doors, the opening or shutting of which causes the steps to slide backwards or forwards, the doors being provided with crank actions for that purpose.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

ROTH, J. *An improvement in rollers employed in spinning machinery, and in other parts of machinery used in the treatment of fibrous materials.* Dated Dec. 3, 1855. (No. 2720.)

This invention consists in reversing the position of the sides of the leather with which rollers, wheels, bobbins, &c., are covered, so that the fibrous matters only come in contact with the rough side.

LEITCH, J. *Certain improvements in melting and blowing up sugars.* Dated Dec. 3, 1855. (No. 2722.)

The sugar is placed in a receiver, through the bottom of which a pipe passes to a steam boiler situated underneath. The pipe descends some distance into the boiler, so that when there is a pressure of steam in the boiler, the hot water is forced up the pipe amongst the sugar, but when the water sinks below the end of the pipe, steam passes up and agitates the mixture until the sugar is completely dissolved, when it is drawn off.

BRECHEUX, F. A. N. *An improved axle-tree for carriages on railways.* Dated Dec. 4, 1855. (No. 2724.)

This invention consists in inserting in or fitting to an axle a chain, cable, bundle of wires, or a rod, which will support the axle in the event of breakage.

KNIGHT, W. *An improved mode of cutting out or shaping materials to be employed in making overcoats, or other similar articles of dress.* Dated Dec. 4, 1855. (No. 2729.)

This invention is for simplifying the means of producing from one piece of material the several parts of overcoats, &c. The inventor describes the directions in which the necessary incisions are cut.

SMITH, W. *Improvements in apparatus for regulating the supply of air to furnaces.* Dated Dec. 5, 1855. (No. 2738.)

The inventor employs a fluid, and by varying the speed of its flow by a tap, or other means, regulates the supply of air to a furnace.

HAWKER, C., and T. P. HAWKER. *An improved method of manufacturing cartridges.* Dated Dec. 6, 1855. (No. 2742.)

This invention consists in the application of gutta percha to the manufacture of a waterproof cartridge, and in a method of

attaching the ball so as to prevent its being detached and dropping out if the cartridge gets wet.

BARROW, J., jun. *An improved process of manufacturing soda and sulphuric acid.* Dated Dec. 6, 1855. (No. 2746.)

This invention consists in the use of manganese or any of its oxides as a substitute for lime, in the ordinary decomposition of sulphate of soda in the "Black Ash Furnace;" and in the use of the sulphuret of manganese so obtained for the production of sulphurous and sulphuric acid.

DUNN, T. *Improvements in fire-arms.* Dated Dec. 6, 1855. (No. 2748.)

In making a mortar according to this invention, the mortar is first cast with a strong thick breech, but with a thinner central and front end or barrel portion. Both the breech and muzzle have a deep flange cast solid upon them, to retain a coil of wire or rod metal, which is added for giving strength to the arm.

ROCK, J., jun. *Improvements in the construction of tents, huts, and portable buildings.* Dated Dec. 6, 1855. (No. 2749.)

The inventor constructs his huts of boards or planks placed edge to edge, without any transverse framing or batten, so that all the shrinkage of the wood may be in one direction, and he secures the planks together either by bolts passing through them edgewise, or by band plates outside of them, and coupled together at the external edges of the planks so that they may be at any time tightened up. Planks so put together are combined into huts by certain methods described. For the roofing of portable buildings the inventor employs flexible coverings which roll up on a roller turned by a winch, and resting in stanchions fixed to the gable ends of the building. The rollers are longer than the buildings, and the tarpaulin falls down over the ends of the buildings, where it is lashed. The inventor forms a tent by erecting two pairs of poles, the upper ends of a pair being connected to each other. Extended over these poles are tarpaulin covers which roll up, a curtain piece being placed across each end. In order to give stability to the tent, he connects the two pairs of poles with each other by a cord, and carries the ends of the same to the ground at some little distance from the tent at each end, and there secures them to plugs driven into the earth.

CORNES, J. *An improved mangle or press, parts of which are applicable to rollers employed for pressure purposes generally.* Dated Dec. 6, 1855. (No. 2750.)

This invention consists in the construction of a mangle or press with two rollers, the upper fixed in its bearings, the lower *capable of up*-and-down motion, and kept in contact with the upper by strong springs, which press against bearings, in which the ends of its axis revolve.

LATTA, A. *Preparing gutta percha in combination with other substances, applicable to various purposes.* Dated Dec. 7, 1855. (No. 2759.)

This invention consists in mixing gutta percha with cotton, coal, flour, and gum-lac, for obtaining various useful products.

DICK, D. *Improvements in machinery to be used in finishing cloth and textile fabrics.* Dated Dec. 7, 1855. (No. 2761.)

This invention consists in passing bands, cords, belts, wire, or chains over the ordinary breadthener, or over breadtheners made expressly to suit.

CRANSTON, H. *An improved method of manufacturing lozenges.* Dated Dec. 7, 1855. (No. 2763.)

Instead of manufacturing lozenges by hand, the inventor proposes to employ a series of cutters or hollow punches, which are caused, by a rod and a crank shaft, to descend upon the material placed upon a smooth surface beneath them.

ELLIS, W. I. *Certain improvements in the slide valve or valves of steam or other motive-power engines.* Dated Dec. 7, 1855. (No. 2765.)

These improvements consist in imparting to slide valves an additional sliding motion in a circular direction, as well as the longitudinal rectilinear sliding motion usually employed, by the use of levers, racks, slides, &c.

LEITCH, J. *Improvements in melting, blowing up, and filtering sugars and other saccharine matters.* Dated Dec. 7, 1855. (No. 2767.)

The inventor employs two vessels connected by a tube reaching nearly to the bottom of the lower. Water is placed in the lower vessel, where it is caused to boil; the resulting pressure forces a portion of the water up the tube into the upper vessel, where it mixes with the oxygen, and kept agitated till all is dissolved. The heat is then withdrawn suddenly, the pressure ceases, a vacuum is formed below, and the liquor is drawn down through a sieve on the top of the tube into the under vessel; or it is retained in the upper vessel by a stop valve, and drawn off thence. The vacuum may be otherwise produced.

GRAY, J. *Improvements in azimuth and amplitude instruments.* Dated Dec. 7, 1855. (No. 2769.)

A description of this invention is given on page 107 of this Number.

GREEN, C. E. *Improvements in huts, tents, and camp hospitals.* Dated Dec. 7, 1855. (No. 2770.)

These improvements consist—1. In con-

structing tents or huts in several parts which are to be held together in such manner that they can be folded up in packages. 2. In making, framing, or covering tents or huts with two or more thicknesses of linen, woollen, or other fabrics, so arranged as to leave space for the free admission of hot or cold air, as may be required. The materials used are severally air and waterproof, and non-conductors.

PROVISIONAL PROTECTIONS.

Dated June 20, 1856.

1454. Alexander Sands, of Manchester, iron founder. Improvements in apparatus for signalling and for saving life and property at sea, part of which is applicable to signalling on land.

Dated June 24, 1856.

1482. Joseph Harrison, of Blackburn, machinist, and Christopher Gelderd, of Lowmoor, Clitheroe, manager, both in the county of Lancaster. Improvements in looms for weaving.

Dated June 26, 1856.

1504. David White, of Winchester-place, Clerkenwell, Middlesex, surveyor. Improved apparatus for the more perfect combustion of gases, for preventing their escape, and the unnecessary radiation of heat therefrom.

Dated July 8, 1856.

1600. George Bradshaw Watkins, of Godmanchester, Huntingdon, clerk. Improved apparatus for obtaining infusions or extracts from various substances.

1601. William Youtman, of Southampton, gentleman. Improvements in valves and plugs.

1602. Joseph Henry George Wells, of Essex-street, Strand, London. Improvements in pistons for steam and other motive power engines and pumps in general, and which improvements are also applicable to stuffing-boxes. A communication from E. Rambaud, of Lyons, France.

1603. Joseph Henry George Wells, of Essex-street, Strand, London. Improvements in governors or regulators. A communication from E. Rambaud, of Lyons, France.

1604. Frederick William Hoffman, of New York, U. S. An improvement or improvements in breech-loading fire arms.

1605. Henry Page, of Whitechapel-road, Middlesex, glass-merchant. Improvements in ornamenting or decorating glass.

1606. Julien François Belleville, civil engineer, of Paris, French Empire. Certain improvements in generating and applying steam.

1607. Robert Martineau, of Birmingham, Warwick, manufacturer, and Brooke Smith, of Birmingham, manufacturer. Improvements in taps for drawing off liquids.

1608. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improvements in repeating fire-arms. A communication.

1609. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improved fountain pen. A communication.

1610. Abraham Herts, of Bunhill-row, Finsbury, Middlesex, commission agent. An improved sheet metal bending and tubing machine. A communication from W. Webster, of Morrisaina, U. S.

1611. Alexander Gray, of Glasgow, N. B., mechanic, and John Rawson, of Bury, Lancashire, engraver. Improvements in means or apparatus for lubricating.

1612. *Louis Bayer, of Soho, Middlesex. An improved stuffing to be used in place of hair or* other substances in which such articles are commonly employed.

1613. Sewall Short, of New London, U. S. Certain improvements in horse shoes and shoes for other animals.

1614. Henry Pigott, of Glasgow, Lanark, N. B., hat manufacturer. Improvements in hats and other coverings for the head.

1615. David Fisher, of Ranelagh-road, Thames-bank, Middlesex, engineer. A composition for coating metal, plates, or wheels, used for grinding, sharpening, or polishing.

Dated July 9, 1856.

1616. William Bridges Adams, of Adam-street, Adelphi, Middlesex, engineer. Improvements in railway wheels, axles, and axle-boxes.

1617. Alfred Krupp, of Essen, Prussia, cast-steel manufacturer. Improvements in the permanent way of railways.

1618. Rudolph Bodmer, of Thavies-inn, Holborn, London. Improvements in self-acting apparatus applicable to certain kinds of machines for spinning cotton and other fibrous substances. A communication from E. Stehelin, of Bitschwiller, France.

1619. George Darlington, of Kingston, Jamaica, West Indies, and John Darlington, of Cannon-street, London. Improvements in the manufacture or production of zinc or spelter.

1620. Ward Holroyd, of Queen's-head, Halifax, York, builder, and William Noble of the same place, cabinet maker. Improvements in machinery or apparatus for cutting wood and stone.

1621. Daniel Webster Hayden, of Glasgow, Lanark, N. B., engineer. Improvements in fastenings for window shutters.

1622. Timothy Jerome, of Great Hampton-street, Birmingham, Warwick, button manufacturer. Certain improvements in buttons for ornamenting and fastening dresses, as also in loops for attaching or holding buttons on garments while in use.

1623. Alexander William Williamson, of the London University, Gower-street, Middlesex. Improvements in obtaining the rosin and sugar of scammony.

1624. William Robertson, of Manchester, Lancaster, mechanician. Improvements in machines for spinning and doubling cotton and other fibrous substances, such machines being of the kinds commonly known as mules and twiners or doublers, and in the means of weighting rollers in the same and other machinery.

1625. Edward Wilson, engineer, of Eccles-street, Dublin. Improvements in pistons for steam-engines driven by steam or any other elastic fluid, which improvements are also applicable to the pistons or plungers of pumps.

1626. Moss Defries, of Houndsditch. Improvements in moderator and other lamps.

1627. Richard Dugdale Kay, of Accrington, Lancaster, manufacturer. Improvements in machinery or apparatus for pressing, straining, sifting, or refining colours and thickened mordaunts. A communication.

1628. Robert Thomas Eadon, of Sheffield, York, steel manufacturer. An improvement in the manufacture of band saws and other endless bands or hoops of metal.

1629. Henry Adcock, of City-road. An improvement in casting iron and other metal.

Dated July 10, 1856.

1630. Frederic William Russell, of Aldgate, Middlesex. Improvements in the mode of coupling railway carriages.

1631. John Marsh, of Nottingham, and John Catt, of Stepney, Middlesex. Improvements in the manufacture of certain textile fabrics.

1632. Paul Prince, of Derby. Improvements in making moulds for casting railway chairs and other articles.

1633. Samuel Hardacre, of Miles Platting, Lan-

caster, machinist. A compound conical spike and spiral double gridded machine for opening, blowing, scutching, and cleaning, cotton, wool, and other fibrous substances.

1634. Charles William Lancaster, of New Bond-street, Middlesex, manufacturer. An improved method of, or apparatus for, inking, printing or stamping surfaces." A communication.

1635. John Fowler, junior, of Havering, Essex, and William Worby, of Ipswich. Improvements in machinery for ploughing and tilling land by steam.

1636. Stephen Martin Saxby, of Rock Ferry, Chester, gentleman. Improvements in ascertaining the errors of mariners' compasses.

Dated July 11, 1856.

1637. Robert Hutton Leadbetter, of Glasgow, Lanark, N.B., merchant. Improvements in the preparation of flax.

1638. Robert Harrington, of Witham, Essex, watch maker. Improvements in umbrellas, parasols, walking sticks, whips, &c.

1639. John Westwood, lamp manufacturer of Lichfield-street, Walsall, Stafford. Improvements in hand, roof, and other railway lamps, parts of which are also applicable to certain descriptions of oil lamps for general purposes.

1640. Thomas Charlton and William Turnbull, of Brentwood, Essex, engineers. Improvements in steam generators.

1641. General Henri Dembinski, of Rue Joubert, Paris, France. An apparatus giving a self-acting motive power, produced by weight, elasticity, compressed water, or any gas whatever.

1642. Jean Baptiste Désiré Chevalier and Narcisse Rabouin-O'Sullivan, of Paris, France. A new or improved method of obtaining or preparing printing surfaces, and in printing therefrom.

1643. Edward Henry Cradock Monckton, of the Parthenon Club, Regent-street, Middlesex. The application of a means or process for destroying grubs and other insects or animalculæ, or infusoria injurious to plants.

1644. Alfred Nicholson Wornum, of Store-street, Bedford-square, Middlesex, piano-forte manufacturer. Improvements in grand piano-fortes.

Dated July 12, 1856.

1645. Benoit Frédéric Ortet, of Rue de l'Echiquier, Paris, France, gentleman. A new metallic composition applicable to the coating of surfaces, and to the moulding and casting of various objects.

1646. Thomas Madely Hartwell, James William Gladwin, and Henry Gladwin, of Manchester, Lancaster, stretchers and finishers. Improvements in machinery or apparatus for stretching woven fabrics.

1647. William Bridges Adams, of Adam-street, Adelphi, Middlesex, engineer. Improvements in the permanent way of railways.

1648. John Pope, of Wincheap-street, Canterbury. Improvements in the application of steam power to ploughing and other agricultural purposes.

1649. William Petrie, of Woolwich, Kent, civil engineer. A new porous material for filters and other like articles, and for certain modifications or improvements in the manufacture of the material whereby it is adapted to the formation of vessels of capacity, to be employed as a cement, as a water and acid proof lining, as a preservative coating, and as a substitute for stone and earthenware.

1650. Abraham Herts, of Bunhill-row, Finsbury, Middlesex. Improved apparatus for holding material during the operation of sewing. A communication.

1651. John Avery, Essex-street, Strand, London. An improved "plate holder" for photographic and other purposes. A communication from Madame Millot, of Saulte-les-Rethel, France.

1652. John Rowley, of Camberwell, Surrey. Improvements in the manufacture of a material as a substitute for leather.

Dated July 14, 1856.

1653. Pierre Beauplant Rassant, of Paris, France. A new mechanical contrivance for transforming an alternate into a continuous circular motion.

1654. Charles Burrell, of Thetford, Norfolk. Improvements in arranging and rendering portable apparatus suitable for distilling from beet root and other vegetable substances. Partly a communication.

1655. Richard Dendy, of Hornchurch, Essex, agricultural implement manufacturer. Improvements in horse-rakes.

1656. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improved mode of securing the plastering of ceilings and walls. A communication.

1657. William Williams, of Dale, Pembroke, engineer and contractor. Cutting and dressing stone by machinery.

Dated July 15, 1856.

1659. William Edwards, of Salford, Lancaster, engineer and tool maker. An improvement or improvements in lathes, applicable also in part or on the whole to tools for boring, shaping, cutting, and screwing metals.

1660. William Clibran and Joseph Clibran, of Manchester, machinists and manufacturers. Improvements in apparatus or mechanism for regulating and measuring gas.

1661. William Watt, of Belfast, Antrim, Ireland. Improvements in the manufacture of starch.

1662. Evan Leigh, of Manchester, Lancaster, engineer. Improvements in the mode or method of generating steam and applying it for the purpose of obtaining motive power. Partly a communication.

1663. John Knowelden, of South-street, Southwark-square, Surrey. Improvements in apparatus for preventing steam boiler explosions.

1665. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in apparatus for consuming smoke, to be applied to lamps and gas burners. A communication from J. B. T. Andry, of Paris, France, silk merchant.

1666. Charles Bell Blyth, of Dundee, Forfar, N.B., manager, and William Parell Butchart, of the same place, mechanic. Improvements in weaving.

1667. George Tomlinson Bousfield, of Sussex-place, Loughborough-road, Surrey. Improvements in pumps. A communication.

Dated July 16, 1856.

1671. James Ford, of Preston, Lancaster, manager, and Peter Knowles, of Bolton-le-Moors, in the same county, overlooker. Improvements in machinery for cleaning and preparing cotton and other fibrous substances.

1673. Richard Morgan, of Acton, Middlesex, gentleman. A pocket-case for containing address cards, stamps, and other similar articles.

1677. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in circular looms. A communication from J. N. Poivret, of Troyes, France, merchant.

1679. Adolphus Frederic Gurlt, of Newington-place, Kennington, Surrey, mining engineer. Improvements in the manufacture of iron and steel.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

1688. Francis Barber Howell, of Lebanon, Ohio, U.S., farmer. Certain improvements in machinery for making corks. A communication. Dated July 18, 1856.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," July 29th, 1856.)

627. J. Rice and W. Rice. Improvements in breech-loading repeating guns and rifles.
637. T. Palmer. Pumps with a new or improved box and valve.
641. P. de Prades. Improvements in wheelbarrows.
652. T. Richardson and G. W. Jaffreys. Improvements in marine steam engines.
671. J. Murphy. Improvements in means or apparatus for stopping or retarding vehicles used on rail or other roads, which improvements are also applicable to the brake wheels in connection with stationary engines.
675. H. Pratt. Certain improvements in the construction of union mills, and in the application of the motive power, apparatus, and machinery connected with the manufacture of flour and bread, parts of which are also applicable for other useful purposes.
681. J. Hinks and G. Wells. Improvements in metallic pens and penholders.
690. T. Heaton. Improvements in self-acting doors and gateways.
692. J. Robertson. Improvements in transmitting motive power.
695. R. Husband. Certain improvements in the manufacture of hats.
697. W. Pitt and E. T. Davies. Improvements in the manufacture of brackets and castors for furniture.
712. R. Collins. An improved agricultural implement.
721. D. Lowe. Improvements in knitting-machinery.
741. J. A. Barratte. A new rotatory steam engine.
754. J. Swyney. Improvements in breech-loading magazine fire-arms.
767. C. D. Gardissal. An improvement in screw stop-valves. A communication.
771. C. J. M. de la Haichois. Certain improvements in paving.
829. H. T. Sturley. An improved compound or breakfast mixture.
839. E. Morris. Improved machinery for raising and lowering weights.
894. R. Richardson. Improvements in railway-switches.
932. J. Jeffreys. Improvements in instruments for aiding respiration.
957. A. Symons and E. Burgess. Improvements in instruments for ascertaining and indicating heat, and also in the parts for making and breaking contact in electric circuits used therewith.
958. A. Symons and E. Burgess. Improvements in apparatus for producing alarums to indicate burglary by means of electricity.
1006. T. Heiffor. An improved method of manufacturing razor-blades.
1019. W. Pilling. An improvement in the treatment of yarns or threads, and in the apparatus connected therewith.
1027. W. E. Newton. An improved method of and machinery for polishing the surface of glass, stone, metal, or other materials capable of being polished by friction.
1040. R. Pearcy. Improvements in machinery or apparatus for twisting cotton and other fibrous substances.
1145. W. Evans. An improved description of plough.
1222. A. Tolhausen. Improvements in clockwork, part of these improvements being applicable to other regulating purposes.
1287. A. Watson and A. H. Williams. *An improvement in bottles, flasks, and other like receptacles for liquids.*
1456. M. T. Crofton. An apparatus for inking stamps used by bankers and others.
1459. J. B. Howell. Improvements in the manufacture of cast steel tyres.
1498. J. Platt and J. Whitehead. Improvements in machinery or apparatus for making bricks.
1504. D. White. Improved apparatus for the more perfect combustion of gases, for preventing their escape, and the unnecessary radiation of heat therefrom.
1522. B. G. Sloper. Improvements in freezing, refrigerating, and cooling, and in the machinery employed therein.
1529. T. F. Henley. An improved process for obtaining arrack or spirit from rice or other grain.
1533. H. Brown and J. Bartlett. The construction of an iron easy arm chair bedstead.
1547. J. Hay and J. Hay. Improvements in the production of pearl barley.
1559. W. H. Hubbard. Improvements in the manufacture of articles for lighting domestic and other fires.
1563. J. Pendlebury. Improvements in machinery or apparatus for bleaching or cleansing textile fabrics or materials.
1568. H. Greaves. Improvements in looms for weaving.
1583. L. Blackstone. Improvements in the manufacture of corks and bungs.
1586. R. Shaw. Improvements in obtaining pressure applicable to machinery for preparing and spinning cotton and other fibrous materials, and other purposes.
1604. F. W. Hoffman. An improvement or improvements in breech loading fire-arms.
1606. J. F. Belleville. Certain improvements in generating and applying steam.
1613. S. Short. Certain improvements in horse-shoes and shoes for other animals.
1618. R. Bodmer. Improvements in self-acting apparatus applicable to certain kinds of machines for spinning cotton and other fibrous substances.
1620. W. Holroyd and W. Noble. Improvements in machinery or apparatus for cutting wood and stone.
1623. A. W. Williamson. Improvements in obtaining the rosin and sugar of scammony.
1666. C. B. Blyth and W. P. Butchart. Improvements in weaving.
1688. F. B. Howell. Certain improvements in machinery for making corks.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEARS' STAMP DUTY HAS BEEN PAID.

1730. Alexander Isaac Austen.
1733. George Spencer.
1740. James Murdoch Napier.
1741. Samuel Barlow and John Pendlebury.
1748. Warren de la Rue.
1758. Thomas Buxton.
1760. Joseph Barrens.
1766. Peter Armand Lecomte de Fontainemoreau.
1771. Thomas Forster.
1772. Benjamin Collins Brodie.
1780. George Katz Douglas.

1791. Philipp Schäfer and Frederick Schäfer.
1793. John Shaw Perring.
1824. Richard Brown Roden.
1827. George Fergusson Wilson and Alexander Isaac Austin.
1907. Joseph Leon Talabot and John Davie Morries Stirling.
1935. Peter Fairbairn.
1967. Benjamin Hornbuckle Hine, Anthony John Mundella, and Thomas Thompson.
2187. Alfred Vincent Newton.

LIST OF SEALED PATENTS.

1856. *Sealed July* 22, 1856.

1066. William Edward Newton.
1213. Edward Hammond Bentall.
1288. William Needham and James Kite.
1316. Christian Rudolph Wessel and Francis Xavier Kukla.

Sealed July 25, 1856.

207. Alexis Jean Dessales.
213. Patrick Doran.
227. Pierre Emmanuel Guérinot.
259. James Mash.
275. George Holcroft, Joseph Smith, and Thomas Holcroft.
283. James Timmins Chance.
290. John Rock Day.
298. Ralph Waller.
322. John Inshaw.
353. William Henry Zahn and Joseph Henry George Wells.
479. Charles Ilee.
495. George Parry.
497. George Tomlinson Bousfield.
897. William Smith.
933. Peter William Barlow.
948. James Nasmyth and Herbert Minton.
1003. Claude Antoine Arnaud.
1065. William Edward Newton.
1211. Charles de Jongh.

Sealed July 29, 1856.

246. Auguste Mathieu Maurice de Bergevin.
254. John Lee Stevens.
265. Henry Render.
272. Matthew Ker.
280. Francis Best Fawcett.
281. Henry Bestwick and Joseph Bury.
286. Charles Catherine Joubert and Léon André Bordier.
292. Benjamin Burleigh.
295. Alexandre Tolhausen.
314. Alexander McDougall.
332. William Kenworthy.
337. Thomas Restell.
352. Christophe Muratori.
379. Stephen Rossin Parkhurst.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

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"LONDON: *Edited, Printed*, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, *in the City of London.—Sold* by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, *Dublin; W. C. Campbell* and Co., Hamburg.

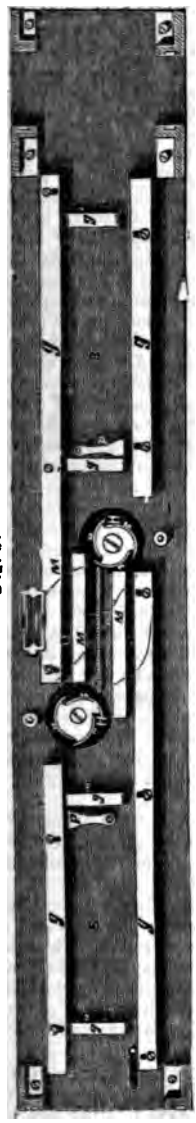
Mechanics' Magazine.

No. 1722.] SATURDAY, AUGUST 9, 1856. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

GRIST'S PATENT CASK-MAKING MACHINERY.

Fig. 5.



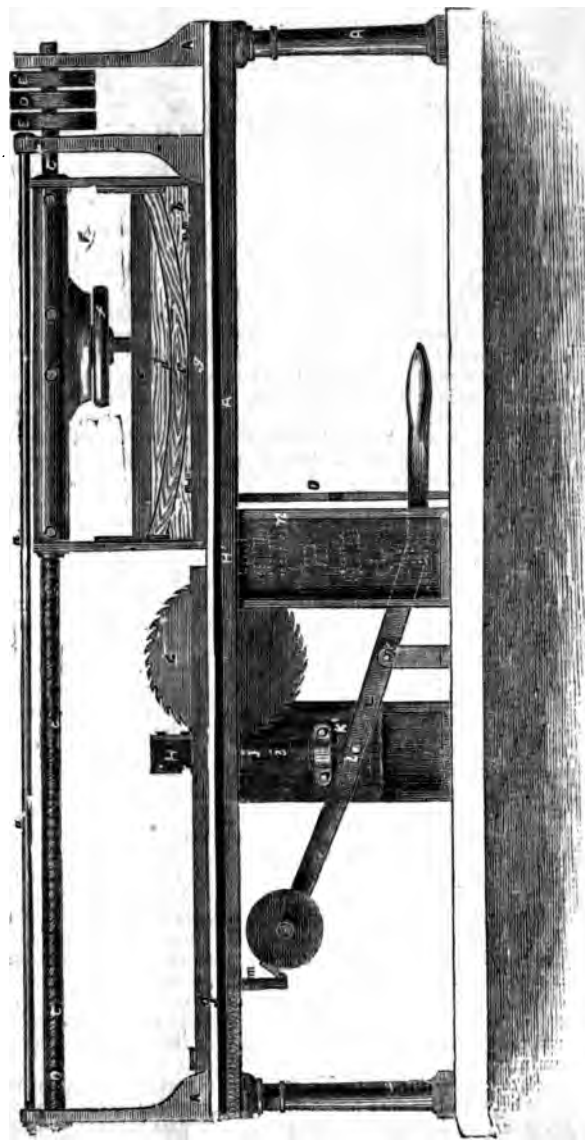


Fig. 3

GRIST'S PATENT CASK-MAKING MACHINERY.

We have more than once had occasion to bring to the notice of our readers the improvements from time to time introduced by Mr. Grist, of Russell-place, Islington, into the manufacture of casks, and the parts of casks by machinery. This has arisen from the circumstance that the making of casks, otherwise than by hand, is an operation to which but comparatively few inventors have directed their attention and efforts with any considerable degree of success, and that no one has done so with anything like the same results as Mr. Grist. The most recent of his inventions, which we are about to describe, certainly comprises the best set of cask-making machines that has yet been produced. The jointing machine, which is the subject of the illustrations on the preceding page, is in reality *multum in parvo*, for while it is most efficient as a jointing machine, it can in ten minutes be altered to a cross-cutting machine, for cutting the staves to the required length, or to a machine for deepening and jointing heading. As a jointing machine it is adapted to the various peculiarities in the formation of staves, giving to them the necessary bilge, quarter, and bevil, and may be arranged to suit any lengths or widths, so as not to cut the timber to waste. We have carefully examined this machine, and have ascertained that two of the kind might be easily worked by one unskilled person, and joint enough staves for one hundred casks (hogsheads) per day. The apparatus for drying and bending the staves, and setting them to the shape of the required cask also possesses great merit, for with it staves may be prepared, jointed, and shaped (even from green timber, which becomes effectually seasoned in the process) and then piled away or laid aside until wanted, occupying comparatively little space. Staves thus produced must greatly increase the facility of transporting casks to foreign parts by avoiding the necessity of making up *packs*, as is now done. The machine for cutting in the heads of casks is peculiarly arranged, in order to cut them of an elliptical shape instead of round; this machine is also convertible, for the parts for cutting the heads can be removed, and it at once becomes a turning lathe. It is worthy of remark that this set of machines has been contrived with a view to simplicity and cheapness, and will, we should think, fall within the reach of nearly all master coopers. The casks formed by means of them are almost mathematically exact, as regards their contents—a circumstance of great value in the case of brewers' casks, for when they are returned empty they can be taken to pieces ("knocked down"), cleaned, and piled away in a small space until they are required, when, by means of the raising or gathering machine, they may be put together by an unskilled person, each in a few minutes. We now proceed to give, first an outline, and subsequently a detailed description of the invention.

First, bending wood to form staves. A metal tube or case is made with sides of the same shape as that intended to be given to the staves, and heat is passed through the tube or case. The blank or piece of wood to be bent is first saturated with hot water or steam, or not, and is then placed on the outside of one of the sides of the metal case, and bent on it by means of a lever, or otherwise kept pressed against it until set to the required shape.

Second, jointing blanks. The blank is placed in a suitable frame to hold it firm while being jointed, and is placed at an angle nearly corresponding with the radius of the intended cask, and moved forward, while one edge of the stave is presented to a saw and then to a cutter or cutters to plane or finish the saw edge. The frame is then passed over to the other side of the saw and moved backward, the other edge of the stave then being presented to the saw and to another cutter. This machine is provided with one saw and two cutters, one cutter before the saw and the other cutter behind the saw, caused to slide into and out of action, as may be required. This machine can be made to act on both sides, forming a double machine.

Third, raising the cask. A contracting and expanding shape is made in wood or metal to suit the inside form of the intended cask, and caused to rotate. The staves are placed on the shape beneath one, two, or more belts; truss hoops are then put on, and the shape and belts removed.

Fourth, chiming and creuzing. The inventor chucks one end of the cask, after being removed from the raising machine, on a suitably constructed face plate of a lathe; the other end of the cask is passed through a collar or ring which revolves between proper rollers. The cask is then caused to rotate so that the end which passes through the collar may be chimed and creused by turning tools or by any other suitable cutters. When one end is finished the collar is removed, the cask drops on a saddle prepared to receive it, which is made to turn and to reverse the position of the ends of the casks, and the operation is repeated on the unfinished end.

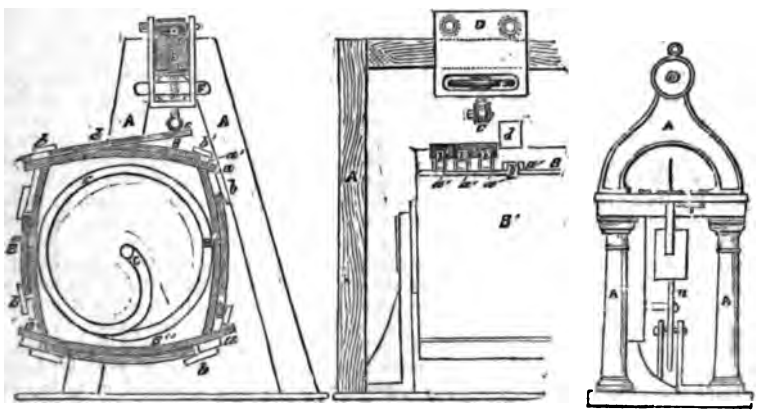
Fifth, cutting the heads. He chucks or places the pieces put together to form the head of a cask between two face plates of a lathe, and causes them to rotate slowly, and the edge or *periphery of the* partially-formed head to pass between two circular saws rotating rapidly, *set at the required angle to* cut off the waste and form the bevils of the head. These saw

cuts are subsequently smoothed by turning or by other suitable means. The mandril or spindle of the lathe is provided with a cam, which acts by means of levers on the slide rest or turning tool, so as to impart to it a rectilinear motion, in order to turn the head an ellipse or oval instead of a round.

Fig. 1 of the accompanying engravings is a sectional elevation, and fig. 2 a front elevation, of so much of a bending machine as is necessary to explain the same. A A is a stout frame; B B′ B″ B‴ are four sides of the hollow curved vessel, over which the staves, or blanks for forming staves, are bent. The inventor prefers to form these sides of boiler plate, and shape them to the curve of the intended stave. In the engraving the side, B, has the requisite curve for a stave for a puncheon; B′ for a barrel; B″ for a hogshead; and B‴ for a kilderkin. The vessel is mounted upon an axis so as to be capable of being turned as required. C is a hot water, hot air, or steam pipe for keeping the sides of the vessel hot. *a a a a′* are stop blocks riveted to the side plates; and *b b b b′*, sliding blocks, for the purpose of retaining the blanks or staves on the side plates when bent, as hereafter explained. D is a travelling block for carrying a screw, E, and hand wheel, F; at the bottom of the screw is a friction roller, *c*. The operation is as follows:—The vessel being heated, or prior to being heated, a blank, *d*, saturated with liquid or steam or not, is placed against the stop, *a*, and the sliding block, *b*, brought over the end to retain it; the opposite end of the blank is brought down by turning down the pressure screw, until the whole length of the blank is brought in contact with the curved side of the vessel, when the end so brought down comes against or near to the stop, *a′*, and the sliding block, *b′*, is brought over and secures it in that position. The pressure screw is turned in the reverse direction, and the travelling block moved on to repeat the operation on another blank. Instead of the blanks being brought down by screw pressure where they are not of too great thickness, a lever may be employed, fitted with a lining shaped to the curve of the intended stave. The blanks are kept on the heated curved surface until set to the curve, when they are removed to a similar cold curved surface, and kept some time after they have set; or they may remain upon the first curved surface, from which the heating medium may be withdrawn until they are cold.

Fig. 3 is a front elevation, and fig. 4 an end elevation of the jointing apparatus. A A is the framework; *e e*, rod for strengthening the upper part of the frame; B B, the bed of the machine, seen more clearly in the plan, fig. *5*; C C is a threaded shaft or screw, free to revolve in bearings in the upper part of the frame; D is a fast, and E E loose pulleys, on

Fig. 1. Fig. 2 Fig. 4.



the end of the shaft; F is a travelling frame, for holding the blank to be cut to the required bevil, bilge, and taper. The head of this frame carries internally a female thread, into which the male thread on the shaft, C, takes, whereby the frame is made to travel to and fro, as hereafter explained. The lower part, *b*, of the frame forms a bed of the desired curve of the stave to be cut, in which a blank, *c*, is placed; *d* is a filling piece, placed on the blank; and *e*, a bar, free to move up and down on V guides in the side of the frame,

F, by turning the hand wheel and screw, *f*. Upon being screwed down, the bar, *e*, holds the blank firmly in its bed while being cut. By means of adjustable guides, *g g' g"*, the frame, F, is caused to travel at an angle, which is so regulated with respect to the shaft, C, and saw, hereafter mentioned, that the stave is cut to the radius it will assume in the finished cask. G is a circular saw; *h*, a pulley, for receiving a band for driving the same; H H' are two sets of revolving cutters, one of which only is made to act upon the stave after it has been cut by the saw, the other being made to fall clear, as presently explained. The cutters are affixed to vertical shafts, I I', supported in suitable bearings connected to blocks, K K', free to move up and down in their frames; *i j* and *i' j'* are respectively fast and loose pulleys on the shafts, I I'; L is a weighted bent lever, having its fulcrum at *k*, and connected by pins, *l l*, to the rising and falling blocks, K K'. This lever is so shaped that while one set of cutters is above the bed the other set must be below it, and the fast and loose pulleys are so set that the band for driving them acts upon the fast pulley of that cutter shaft only of which the cutters are above the bed and in a position to work, while the band working upon the loose pulley of that set of cutters below the bed and out of work, takes little or no power from the prime mover. *m* is a spring catch, which takes into a nick in the weighted end of the bent lever, L, and keeps it in the position shown in the engraving until liberated, as presently explained; *n* is a stop, which rises through the bed, and is free to rise and fall by the lever engaging itself in one or other of the projections, *o o*, and carrying it up or down with it; *p p* are spring stops, to prevent the frame, F, returning after being traversed, as hereafter described. In the bottom of the frame there are slots, to enable it to traverse over the transverse guides, *g' g"*, when at the end of its stroke. M M, shown in dotted lines in the plan, fig. 6, are shoes or receivers, kept gently pressed by springs against the saw, for the purpose of receiving the waste cut off by the saw, and keeping it clear from the cutters. There must be two driving bands for the fast and loose pulleys, D and E E', arranged to drive in contrary directions.

The operation is as follows:—Supposing a blank to have been secured in the frame, F, and the frame to be in the position shown in the engravings, the cutters, H, will be raised above the bed, and in the position for working; now, slip the band from off the loose pulley, E', on to the fast pulley, when the screw shaft will cause the frame, F, to move towards the opposite end of the machine, and, in its progress, it will present the whole of one side of the blank first to the saw, which will leave a rough saw cut on the edge or side of the blank, and then to the revolving cutters, H, which will trim and smooth the edge. On arriving near the end of the machine the bottom of the frame, F, will come in contact with and push back the spring catch, *m*, whereby the weighted lever will be liberated, its weighted end will fall and carry down the cutters, H, and consequently lift up the cutters, H', above the bed, and into the position for working; it will at the same time raise the stop, *n*. Simultaneously, or nearly so, with the frame driving back the spring catch, *m*, it comes against a stop, *q*, on the screw shaft, and the slots in the under part thereof coinciding with the cross guides, *g" g"*, the frame traverses or shifts over to the opposite side of the machine, and is prevented from returning or falling back by the spring, *p*. Immediately on the frame, F, assuming this last-described position, the bands are shifted, that is, from D back to E', while the band which was on E is shifted on to D, whereby the screw will be driven in a contrary direction, and will bring back the frame, causing the partially-formed stave to be first sawn, then smoothed, and finished on the side opposite to that already finished. As soon as the frame reaches the stop, *r*, upon the screw shaft, it throws the band, by suitable levers, on to the loose pulley, E, and stops the machine. The stave being finished or "jointed," is removed by an attendant, and a "blank" is inserted and secured in the frame, F; the handle of the lever, L, is depressed until the weighted end thereof is caught by the spring catch, *m*; this motion of the lever will bring down the stop, *n*, free of the bottom of the frame, and will permit of the frame assuming the position from which it originally started, when the band is slipped from the pulley, E', on to the fast pulley, D, and the operation is repeated, as before described. The guides, *g g' g"*, must be shifted to suit different sized staves. Although it is preferred that the blank or piece of wood for forming the stave should be bent by the bending apparatus hereinbefore described, or by any other means, prior to being inserted in the frame, F, to be jointed; yet such is not absolutely necessary, as a blank saturated with liquid, steam, or otherwise softened, may be used, and may have the requisite curve given to it by pressure between the curved surfaces in the frame, F.

(To be continued in our next.)

THE NEW AMERICAN STEAM FRIGATES.

THE American navy has recently been augmented by the addition of six large steam frigates. The following are their names and lengths, the latter being measured from the fore side of rabbet of stem to the aft side of the foremost stern-post, 12 feet above the lower edge of the rabbet of keel:—

Minnesota . . .	264	feet 8	1-2 ins.
Wabash . . .	262	„ 4	„
Merrimac . . .	255	„ 9	„
Roanoke . . .	263	„ 8	1-4 „
Colorado . . .	263	„ 8	1-4 „
Niagara	315	„	

The opinions of scientific persons in America are already greatly divided respecting the merits of these vessels, and we doubt not that in extending their steam fleets the Americans have to learn much that experience has rendered familiar to the surveyors of our navy.

The *Scientific American* says, in speaking of the above vessels, "Excepting the *Niagara*, they have all been built by government naval architects. The *Merrimac*, thus far, has done little credit to her builders, especially her engines. At least these appear to be her most defective parts, as her recent long passage from Norfolk to Havana, was caused, it is said, from her machinery becoming disabled.

"When all these frigates are completed, it is believed here that the *Niagara* will far surpass them all in every respect. If this proves to be the case, it will be a strong argument in favour of letting out government work to public contractors, and abolishing national naval yards altogether."

On the other hand, an intelligent correspondent of the *Journal of the Franklin Institute* writes as follows respecting the *Niagara*:—"The readers of the *Journal* are, no doubt, aware that this steamer is building under the exclusive direction of Mr. Steers, noted as the builder of the yacht *America*, who has been employed by the Secretary of the Navy for that purpose. Mr. Steers has had his own way, and if he fails in any particular, the fault will be his own. Having recently visited the vessel, I will give you my impressions in relation to her; which, I am sorry to say, are not as favourable as I could wish. She has been designed for great speed, having one-half more power than the other vessels now building, and in taking care of that point, many others of equal or greater value have been overlooked. I have no doubt she will be fast; in fact, I am quite sure of it; but her coal bunker capacity will only be about 12 days' full steaming, *if so much*. Her capacity for stores is so much below what it should be, that her water-tanks are being constructed to fit down to the bilge, filling the space between the kelsons (which it is all essential should be left open and arranged for easy cleaning in warm climates). When the ship was commenced, 100 feet was given up to engines, boilers, and coal-bunks; but since her internal capacity has been found so small, seven feet of this space has been taken off, which has reduced the coal capacity to a very low point for her power. On the berth deck the officers' quarters are very roomy, and occupy a large portion of it. While the forward part, devoted to the crew, will (considering the number that occupy it) be found very small. Her gun deck, which is also the spar deck, will no doubt have sufficient room for her small armament of 12 guns. Compared with the other five war steamers, she will have the advantage of speed only, and this is of no advantage in an engagement (unless it be to run away); they carry 40 guns, and at each broadside will discharge more than double the weight of shot or shells; they have two tiers of guns, and every shot would be effective in close action, while her guns all being on her upper deck, high above the water, would often fire too high, particularly in close action with a low vessel. To the eye, externally, the *Niagara* is very large, but internally she is found very small for her tonnage. This deception is owing to her high rail, which deceives the eye looking from without, and having but two decks, while the other vessels have three. Her draught of water will be greater than theirs, so that she can only enter a few of the harbours in the world. It has been quite the fashion for some years past to decry our naval steamers (which are really unsurpassed by any naval steamers of the same tonnage afloat), and the editor of one of our nautical magazines has, in his zeal for improvement, often asserted that it was easier to make a war steamer correct in every respect than a private vessel, because in the former the load was known, while in the latter it is constantly changing. If he had asserted that to a constructor *knowing* what were the requirements of a war steamer it would be easier, the remark would have been a true one; but I hold that the building of war vessels is as much a profession as the building of merchant ships; and, although I have a very high respect for our private shipbuilders, who have raised the character of our merchant marine to a point far above that of any other nation, yet I doubt if any of them are fully acquainted with all the requirements of a man-of-war. I am certain that the constructor of the Niagara finds many things overlooked, and hence the

difficulty of finding room for all she has to carry. I do not wish to be understood as condemning the *Niagara*, or fully approving the other ships; both can, no doubt, be improved, and a proper medium between them be found, where capacity will not be sacrificed to speed, and where the number of guns shall exceed three to each 1,000 tons measurement. The other five steamers building are, no doubt, indebted somewhat for their form to the desire of using up the timber frames long on hand at our navy yards. With a fresh lot of timber to work from, six inches more head room on the berth deck, and side lights a little less antique, I believe our naval constructors would produce vessels creditable to the navy, if not up to the Young America standard of everything for speed and nothing for capacity."

TRIALS OF REAPING MACHINES IN FRANCE.

THE programme of the recent Universal Agricultural Congress at Paris announced that several prizes would be given to the exhibitors of superior Reaping Machines; but in consequence of the impossibility of experimenting in the month of June with these machines, the Minister of Agriculture, Commerce, and Public Works, deferred the trials of those exhibited until the ripening of the crops. These trials took place on Saturday last, at Courcelles, in a large field of corn, which was divided into lots, of about 20 *acres* each, by broad paths, along which the machines passed to their respective positions.

There were seven machines put upon trial; viz., two of M'Cormick's (one by M. Bella, of Grignon, and one by M. Laurent, of Paris); Hussey's, by Mr. W. Dray; Manny's, by Mr. Roberts; two of M. Mazier (Orne); and a single-horse machine, by M. Simon, of Paris.

Of all these, three only accomplished their tasks—those of Mr. Dray, and MM. Bella and Laurent. The others either stopped of themselves, or were stopped in consequence of their defects. In the language of *La Presse*, "*Elles maltraitaient le blé d'une façon pitoyable.*"

The chief interest of the trials of course became concentrated upon M'Cormick's machines by the French makers, and Hussey's, by Mr. Dray; and it was to these *that the prizes were awarded.* The first prize was not adjudged to any one, none of the machines exemplifying that degree of excellence for which alone, if attained, it was designed. Two second prizes, of 400 francs and a silver medal each, were accorded to MM. Bella and Laurent; and the third, of 300 francs and a bronze medal, to Mr. Dray. The reason that the fourth prize, and not the third or second, was given to Mr. Dray was, that a greater number of labourers were employed in connection with his machine than with either of the others. This is an objection which, we believe, Mr. Dray proposes to obviate, if possible, in the future.

LANCASTER'S UNITED SERVICE SQUARE.

MR. CHARLES LANCASTER, the well-known gun-maker, of New Bond-street, has recently registered an "United Service Square," which is an exceedingly useful instrument. It is represented in plan and side view in figs. 1 and 2 respectively. Its

Fig. 1.

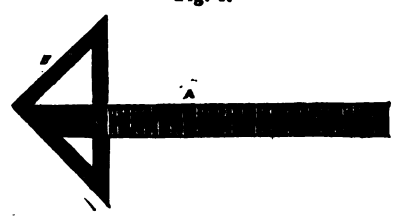


Fig. 2.

construction will be understood from an inspection of these figs. It may be formed of any suitable material and used as a drawing square; for finding the centres of circles; for setting out mitre joints internally and externally; for proving angles and squares; as a rule; and, generally, as an architect's, engineer's, or a mechanic's instrument.

WILSON'S PNEUMATIC MODERATOR FOR CHIMNEYS.

MR. W. G. WILSON, of Gray's-inn-lane, London, has recently introduced a very efficient moderator for chimneys, which is represented in the annexed engravings, fig. 1 being a plan of one fixed in a chimney; fig. 2, a section, through the line *a*, *b*, of fig. 1; and fig. 3, a section of a flue with the moderators fixed therein. A is a frame, let into or affixed to the brickwork; B, a

balance plate or valve, free to oscillate upon an axis or axes C; the weight D is sufficient to keep the plate when at rest in the

Fig. 1.

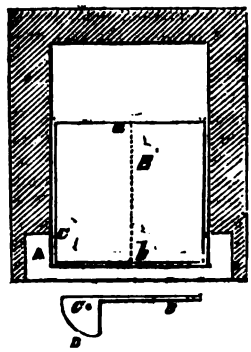
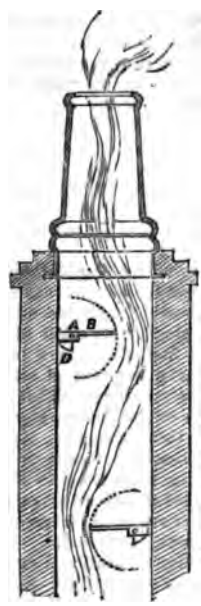


Fig. 2.

horizontal position shown in fig. 3. In order to allow of the free escape of smoke or heated or foul air, the area between the edge of the plate and the opposite side of the chimney should be equal to that of

Fig. 3.



the cowl or chimney pot, and the moderators should be fixed on opposite sides of the chimney, as shown in fig. 3.

Any down draught entering a chimney with these moderators therein would depress the top plate, and would thereby be deflected upon the next in succession, and so on, until its force became neutralized. The plates being free to move both upward and downward, would yield and allow passage to a sweeping brush, both in its ascent and descent.

These moderators are equally applicable to ventilating flues as to chimneys.

BLASTING THE STUMPS OF TREES.

On Monday last, Captain Norton practically proved the efficiency of his "Percussion Blasting Cartridges," for blasting the stumps of trees in a timber yard, in Church-street. Having bored a hole with an auger rather more than half way down into the most knotty part of a large elm stump, one of the cartridges, having a wooden head, was inserted, and an iron bar of the same diameter as the auger, having a cavity or hollow in its lower end to receive the small percussion appliance, was then put in over the cartridge, so as to reach within about two inches of the head of the cartridge, the bar being kept in this position by a clip as well as by its fitting tightly in the hollow bore of the stump. A long plank of timber with one end on the ground and the other end held over the bar by a long rope, was then allowed to fall on the upper end of the iron bar, and the cartridge was instantly fired, and the stump rent asunder. This method of splitting the stumps of trees when other means have failed, may be beneficially put in practice for procuring firewood instead of allowing the stumps to go to waste. The iron bar being of the same diameter as the auger, it necessarily fits air-tight in the hollow above the cartridge and allows of no escape of the elastic gas when the charge explodes, thus concentrating the whole force of the explosion upon the solid stump; besides this, no tamping is required, and the percussion appliances obviate the necessity of any fuse. Captain Norton, therefore very appropriately (although somewhat awkwardly) pronounces this means of blasting to be on the "Highest pressure, no safety-valve, steam boiler exploding, gun barrel bursting principle," and as the percussion appliance is separate from the cartridge, and only brought in contact with it when required, there can be no fear of any accidental explosion. The shattered appearance of the blasted stump shows what the effect of his rifle percussion shell would be in the hull of a man-of-war, when fired from a sixty-eight pounder rifle cannon.

FOREIGN INTELLIGENCE.

Scientific, Engineering, Architectural, &c.

A Mine of Aluminium.—Although the making of this new metal has been hitherto effected from clay, it has been found that it is most profusely to be obtained from a mineral which occurs in Norway. A shaft of above thirty feet has been sunk through a compact mass of *Ceramine*, which will yield hundreds of tons of this useful metal. On the surface the ore is of a light colour, but on descending lower it becomes darker. A Mr. Taylor is at the head of this Norwegian California.

France. — Provision for Workmen on Public Works.—The French Government have ordered that part of the Orleans property should be spent in the building and endowing of a huge hospital for workmen who have become injured or invalided on the public works. Another building is to be erected as a convalescent hospital, near Paris, to be arranged on a new plan, with but very few beds in the single wards.

Berlin. — Supremacy of Engineering Science.—The many great works going on now in the world—thirty railway lines projected in Turkey alone—will cause a great drain, not only of workmen, but also of the *scientifics*. Thus, all the young men whose term of study expires next autumn, at the Polytechnic Institution of Berlin, are already engaged. One student, quite young, has obtained the situation of superintendent of mills at Damascus, with 3,000 thalers yearly salary.

France. — Congress of Aeronauts. —The French Government have rendered some aid towards the holding of a congress of persons conversant with aëronautics at Dijon. Several members of the French Institute will attend, and probably make this gathering one leading to a *new* advance in the "*flying by man.*"

[*Communicated by* Dr. J. Lotsky.]

Prize Essay on the Prevention of the Smoke Nuisance. By Charles Wye Williams, Assoc. Inst. C.E. London: John Weale, 59, High Holborn. 1856.

(*Continued from p.* 110.)

Section 4 examines the class of inventions which are designed to burn smoke by the aid of *hot air*. This is a large field for discussion, the advocates of the hot and cold air systems having carried their respective views to the very verge of personal hostility. Indeed the opponents to the introduction of cold air to the gas and flame in a furnace have long insisted on its being absolutely *injurious; not only* diminishing the temperature, but destroying the iron plates themselves. One of the earliest and strongest opponents of the use of cold air was Mr. Robert Armstrong, of Manchester, whose treatise on boilers has had a large circulation. This discussion, then, is highly important, as it involves the very principle of a large class of existing patents. It will be right therefore to put the views of both parties in their own language.

Mr. Armstrong contends, that "cold air passing into the flame, drives the latter up against the boiler bottom in the manner of a blow pipe, causing it to impinge, with peculiar intensity, against that part of the boiler bottom immediately exposed to the direction of the blast. That on the other hand, as soon as the fire-grate has burned bright, the cold air striking against the same part of the boiler bottom, which had just before been unduly expanded by intense heat, a sudden contraction of the metal necessarily ensues, producing such an alternate heating and cooling with accompanying expansion and contraction of the boiler plates, as would inevitably cause their destruction."

This theory of expansion and contraction is treated in the Essay as purely imaginative, "the temperature of the plate never much exceeding that of boiling water;" and therefore, that expansion or contraction of the plates of a boiler could not possibly occur. For the proof of this, reference is made to the author's treatise on "the Combustion of Coal," where it treats on the durability of plates. The idea certainly of a large body of air "driving flame before it," acting as a blow pipe, does not appear to be a sound one. But, that this body of cold air should "pass through the flame," and then chill and contract the iron plates is, at least, contradictory.

The history of the application of hot air in the manufacture of iron is examined, with the view of showing that it can have no reference or analogy to its effect when in contact with the fuel alone, in a furnace employed for the generation of steam. And further, that as the amount of heat generated in the process of combustion can only be in proportion to the *weight* of the air employed, the act of heating the air, and thus reducing the weight, in proportion to the volume, could only have the effect of enlarging the bulk of the air required for the combustion of any given weight of coal.

The difficulty of heating a mass of air is here adduced in proof of the self-deception of those patentees who asserted that the air was really heated, in the absence of all published proof. By this absence of proof, the author of the essay appears to a certain extent justified in the strong observations he

has made on the system and its advocates, although we are more lenient in supposing that these patentees themselves generally entertained an erroneous impression as to the effect of their several systems, rather than that they kept up the statement as a mere trick of trade.

The essay comments strongly in condemnation of the absurdity of some of their plans, and, among others, that of Mr. Lee Stevens, and his method of causing the air to be "intensely heated" by "passing it between two strata of fire."

The change produced on the air, mechanically or chemically, by the act of heating it, is then illustrated by experiments which seem to leave no doubt of the fact that the only effect must be as there described, viz., "As the bulk of the air *absolutely required* is already inconveniently large—being *ten times that of the gas*—any further enlargement can only increase the difficulty in effecting that mixing and diffusion which is the *sine qud non* of chemical action." Hence the point for consideration is, whether the same *weight* of air "would be more effective in generating heat, if introduced at 50° or 500°?"

The practical effect, then, is stated to be this, that as 100,000 cubic feet of air are absolutely required for the combustion of the gas of each ton of coals, no less than double that quantity, or 200,000 cubic feet, would be required, were it raised to the temperature of 500°.

On the whole, the essay appears conclusively to have established the fact that the heating of the air, if applied to ordinary furnaces, and under atmospheric pressure, is not only injudicious, but injurious; and if the advocates of the hot-air applications continue to maintain their position, it will behove them to fairly grapple with the arguments adduced by Mr. Williams.

Section 5 treats of the effect of mechanical apparatus in the prevention of smoke. This is very impartially considered. Due credit is given to those plans which adopt mechanical appliances, and the cause of their respective effects examined. Of these the essay selects as the most prominent, as well as the most successful, Brunton's revolving grate, Stanley's self-feeding apparatus, and Juckes' moving bars. The object of these three plans — in attaining which it is stated they are all successful—is the supplying, continuously and mechanically, a given quantity of coal to the furnace in given times, and thus preserving a uniform depth over the entire surface of the grate. From this mechanical uniformity of supply and distribution all their advantages as regards combustion are shown to be derived. The essay then gives a description of the mechanical operation of each plan, and its direct connection with the uniformity of supply of air on which the whole effect is based.

"The great defect," the essay observes, "of mechanical appliances consists in their inflexibility;" by which is meant that their useful application in the generation of heat and steam is confined to special circumstances, but inapplicable to others; for, "so soon as the quantity of heat or steam required becomes greater than could be produced by that uniformity of moderate supply and demand, and when a more rapid or irregular supply of steam is called for, the uniformity on which the whole depended is broken through, and the apparatus becomes inapplicable. An irregular supply of fuel necessarily produces an irregular supply of gas, with a commensurate irregular demand for air, with all the liabilities of imperfect combustion and the formation of smoke." This is stated to account for the fact that such plans, though all-sufficient in some manufactories, are often the reverse in others.

Among the mechanical contrivances examined, that of "the Venetian-blind system" is specially noticed, from the various and even contradictory accounts given of its merits. "In one patent it is stated as having the double power of both causing the air to be heated and the smoke burned. In another, the same contrivances, when applied in the ash-pit, are described as keeping both the air and the bars in the coolest state. In a third (Prideaux's), the effect is described as both heating the air in its passage and regulating the supply."

In the case of this latter, (to which, as we recently intimated in a former article, an exaggerated degree of merit has been attributed,) the essay points out the fallacy on which the assumed effect is based. This inquiry is the more important as Prideaux's self-closing valves have been introduced into several of Her Majesty's steam vessels, under the impression that they regulated the supply of air to the furnace gases in a "gradually diminishing manner, in harmony with the gradually diminishing requirements of the fuel sufficient to prevent all smoke." In the essay, Mr. Williams has demonstratively shown that no such "gradually diminishing" demand for air exists, but that, on the contrary, the very moment when the valves are closed and no more air admitted, is a moment when a full supply is demanded—the charge being then about half-consumed. The essay also goes on to show that as regards the prevention of smoke, the valve is of no use whatever, that effect being produced by introducing the air through numerous small apertures,

as suggested in Mr. Williams' expired patent of 1839; or through the series of closely set vertical laths by which the air is caused to enter in thin films—the effect being the same in both cases, namely, that of introducing it in a *divided form*, and thus facilitating its mixture with the gas in the furnace.

In this section the author takes some pains in pointing out the common error of condemning the principle of so admitting the air, because it may have been found insufficient in individual instances. "If an Argand oil lamp," he observes, "burn brilliantly at one time, and be defective at another, producing much red flame and smoke—knowing that nature's processes are uniform and invariable, we rightly infer that the cause of the defect must be, either in the manipulation, or the imperfection of the apparatus. It would, therefore, be no reproach to Davy or Argand that their lamps should be ill-constructed or mismanaged. So in the case of the furnace." This is correct, and we concur with the author in saying that as the error is not in the principle of admitting the air, but in the mode of carrying it into practice, it becomes the special duty of the engineer or experimenter to discover the cause of the discrepancy and to remove it.

(*To be continued.*)

The Joint Stock Companies Act, 1856: with Introduction, Notes, and Index. By CHARLES WORDSWORTH, Esq., of the Inner Temple; Barrister-at-Law, Counsel to, and Associate of, the Institution of Civil Engineers. London: Shaw and Sons, Fetter-lane. 1856.

IN our Number for January 26, of the present year, we drew the attention of our readers to Mr. Wordsworth's excellent edition of the *Limited Liability Act*; we are much gratified in now bringing to their notice the *Joint Stock Companies Act*, edited by the same gentleman, who is well qualified to expound it, and to supply such comments as may be useful to the public. The work is all that can be desired.

On the Introduction and Progress of the Screw Propeller; with Statistics of the Comparative Economy of Screw Ships and Paddle Vessels for Her Majesty's Service. London: Longman, Brown, Green, and Longmans. 1856.

This is a pamphlet containing a collection of articles from various newspapers, recounting the merits and claims of Mr. Francis Pettit Smith, as the first practical introducer of the screw propeller, *together with a few statistics*, and a list of subscribers to the fund designed to furnish a suitable testimonial to that gentleman. It is gratifying to observe that the list indicates that the services of Mr. Smith are very generally and very highly appreciated.

Vitrified versus *Porous Drain Pipes.* London: Reynell and Wright, Little Pulteney-street, Golden-square. 1856.

Most of our readers are probably aware that at the Metropolitan Board of Works, and elsewhere, considerable discussion has lately taken place concerning the respective merits of the Aylesford and stoneware drain pipes. In this pamphlet a number of statements and opinions respecting the Aylesford pipes are collected together. It contains reports by Dr. Letheby, Professor Way, Dr. Thomson, Mr. Haywood, Mr. Rawlinson, and other persons. The subject is by no means an unimportant one, and in this pamphlet one side of the question is very fully set forth.

Earthwork Table, to Calculate Quantities for all Lengths, Bases, and Slopes. By JOSEPH LOUIS GALLOTT. Dublin: Hodges and Smith. 1855.

This is a large sheet table, in the preparation of which the author has been well seconded by the publishers. It is supplied with the necessary explanations, and will greatly reduce the labour and facilitate the operations of the calculator.

ON THE ORIGIN OF THE CENTRAL HEAT OF THE GLOBE.

To the Editor of the Mechanics' Magazine.

SIR,—In former years I have been kindly permitted to appear in your columns as an advocate for what is termed the "material theory of heat." I have endeavoured to maintain the hypothesis that the phenomena of heat are occasioned by the presence of an imponderable form of matter, which, for the sake of a name, we call caloric. I look upon one theory as better than another, when its language appears to be more in accordance with known facts. But although I may prefer one theory to another, and may attempt its advocacy, I am not so readily disposed to affirm that any theory in physical science is absolutely correct, and perhaps I should be still more reluctant to admit such an affirmation if made by another party.

It is in subservience to these general views, thus expressed in the abstract, that I am about to offer some observations in explanation of the origin of our earth's internal heat. In so doing, I adhere to the notion that heat is not motion, but matter.

Perhaps I might here observe that those who argue that heat is motion, are not quite so "immaterial" in their theory as some parties seem to imagine. "Motion," after all, is a term which means "matter in motion," and I think that the hypothesis of a "subtile elastic medium" pervading an apparent vacuum in order to propagate the vibrations which occasion the phenomena of heat, is quite as "material" a theory as that which supposes the phenomena in question to depend on the existence of a "subtile elastic fluid" pervading all the forms of matter.

Accepting the theory that heat has a material existence, we will endeavour to inquire into the causes which have produced the internal heat of our globe. We will not now attempt to demonstrate the existence or degree of that heat, but we will take for granted that at a depth of about one hundred miles from the surface of the earth, there exists an intensity of heat sufficient at the surface to melt the hardest and least flexible forms of matter with which we are acquainted, so that we are led to the conclusion that the globe is an immense mass of fused igneous material, glowing with inconceivable heat, surrounded with a crust or shell bearing a less proportion to the entire mass than the rind of an orange to the size of its pulp. The question arises—From whence proceeds this enormous heat?

Taking the calorific theory as the basis of my argument, I lay down this principle—that the particles of caloric are repellent of themselves, but are attracted by ponderable matter. If we take any particular portion of matter, whether it be air, ice, wood, or iron, and by any process succeed in bringing the particles of that matter into closer proximity, we thereby bring the associated particles of caloric also into closer contact. But as caloric repels itself, we have reason to expect that when the calorific particles are forced into a more confined space, they will endeavour to escape, and will produce an effect upon surrounding bodies. Thus, if we take a portion of ordinary atmospheric air, and suddenly condense it in a syringe, the calorific particles being quickly brought into a much closer contact than before, will endeavour to fly off, and the caloric thus evolved may be sufficient to ignite a piece of German tinder. I might bring many illustrations to bear on this point, and might go into the whole subject of latent heat, to say nothing of electricity; but time and space will not allow such amplification at present, and what I have said will furnish a sufficient clue to the intelligent and candid reader.

In the next place, I come to consider the law of gravitation. From this point of view we see every particle of ponderable matter attracting every other particle with a force graduating inversely as the square of the distance, and directly as the mass.

Hence we learn that if a portion of atmospheric air were to find its way from the surface of the earth to a depth of thirty-four miles through the crust, the effect of gravitation would be such as to condense it to an equality with water. This degree of condensation would far exceed anything accomplished by a condensing syringe, and the degree of caloric thus evolved would be proportionably great. So again, if we suppose a portion of water finding its way into the bowels of the earth to a depth of 362 miles, we must allow that it would there have a density equal to that of quicksilver at the surface. And we cannot admit so great an extent of condensation without a proportionate liberation of caloric. The whole process is like that of wringing a damp cloth, or squeezing a moistened sponge, whereby the particles of water are forced into closer contact, so that the water falls in drops or streams from the compressed material.

To proceed still further. If we suppose a mass of ordinary marble transferred to the centre of the earth, its density would be increased 119 times. And I think we have good reason to believe that the denser forms of matter at the earth's surface contain more latent caloric than those which are more rare; so that if we could condense water as readily as air, we should produce an enormous degree of heat by the process. What is called friction, and which is generally exercised on the denser forms of matter, is really a species of compression or condensation, and we know that in this way our stores of heat seem almost inexhaustible. If this argument be correct, how enormous must be the degree of heat evolved by the compression of the earth's materials in obedience to the law of gravitation! The liberated caloric is burning the vitals of our globe, rendering the interior one vast incandescent mass, while the liquid fire is rolling perpetually beneath the vast concave of granite, at times lashed into a storm by the rush of confined gases, the igneous waves of molten matter undulating under the overhanging rocks, and occasionally agitating the very crust, till the living occupiers of the surface reel like the mariner upon the deck of his ship, and the devastating earthquake topples down the towers and palaces of men, until the imprisoned elements find partial vent through the roaring craters of existing volcanoes, and the fiery surge rocks itself again to comparative rest. Thus tremendous may

be the results of those simple processes to which I have alluded in the present article.

I might carry the theory through the whole planetary system, and far back into the past history of the universe, but I have already encroached extensively upon your columns, and have perhaps drawn sufficiently upon the patience of your readers.

I am, Sir, yours, &c.,

JOSEPH PITTER.

284, High-street, Borough,
London, August 5, 1856.

ADULTERATION OF INDIA RUBBER (CAOUTCHOUC).

To the Editor of the Mechanics' Magazine.

SIR,—As you are the friend of engineers I take the liberty of submitting to you for insertion for their benefit a brief account of the adulterations by cheap compounds mixed with caoutchouc or India-rubber, and in which they should be interested, seeing they use the article very extensively. Java and Para rubber will float upon water, and all manufactured goods free of foreign matter are of the same density; and just in proportion as manufactured articles, such as valves, rail buffers, carriage and engine springs, washers, hose, &c., *sink in water*, so in exact ratio are they adulterated with some cheap pigment, of which the following are a few, and usually in extent from 30 to 100 per cent. Say, then, chalk, Paris white, Cornwall or Porcelain clay, barytes, oxide zinc, white and red lead, ivory black, lamp black, black lead, Spanish brown, &c., &c. Interested manufacturers will tell you they improve the article, bear greater pressure, &c.; but as a rule, this is mere trade subterfuge, the truth being, it enables manufacturers to obtain extortionate profits, and *which, in my next paper, when I submit the exact formulas, will be very clearly seen.* Engineers do not seem sufficiently alive to this question of density. Of course, in coloured articles it is necessary to use some pigment, but it is the *monstrous excess* that I wish to expose, and applies perhaps more particularly to those manufacturers who adopt what they term the American inodorous system. I think it only fair to Messrs. Macintosh and Co., to admit, that most of their goods I have examined appear genuine, and float on water; but I know nothing, and have no interest whatever in their establishment, but simply state the fact, because I have found they form the exception to this adulterating or mixing system.

What I wish more especially in this paper to impress upon the minds of engineers, is the ready mode they have of discovering or ascertaining whose make is best and cheapest, and that it is more likely an India rubber valve of same dimensions at 2*s.* 6*d.* per lb. will cost more money than one at 4*s.* 6*d.* per lb., arising solely from the extravagant mixture of these cheap pigments, and its great density over the latter.

Java India rubber, which is mostly used, is at this moment about 7*d.* per lb., and best Para sheet about 1*s.* 11*d.*

I am, Sir, yours, &c.,

W. H. HERBERT.

Mitcham Common, July, 1856.

FRENCH PATENTS.

To the Editor of the Mechanics' Magazine.

SIR,—Will you please to state, for the special information of your present correspondent, and the general information of your numerous readers, what is the law and practice of France as applied to the granting of patents to Englishmen? I mean in reference to one particular point, which appears to me to have acquired a new feature of late, in consequence of a recent practice that has sprung up here. Whatever be the information elicited, or the decision arrived at, it must exercise an important influence on all patents now and hereafter applied for by Englishmen in the empire of France; I mean as to the *time* of making such application, in order to secure a valid patent.

I will now state my case. I am a patentee; I have just specified, and my patent will soon be printed by her Majesty's Commissioners, and I am informed that within a week after it is delivered to them by the Queen's printers they will despatch three of the printed copies to Paris to be deposited in the Conservatoire des Arts et Métiers, and other places, for general examination and reference.

Now this is the point:—Is it held in France, as in England, that the prior publication and description in a *printed book* of any invention bars an inventor or presumed inventor from taking out a valid patent for such invention? and if so, does the printing and publishing of our specifications as now practised here, and their immediate transmission to France, constitute such a prohibiting publication?

If this be the law and practice of France, then it is high time the world of inventors and intending patentees should be informed of the fact, so that they may always apply for their French patents before the publication in this country of their printed specifications bars them securing their monopoly in that country.

I am, Sir, yours, &c.,

SHETLAND.

London, Fenchurch-street,
July 29, 1856.

[Any patent agent who understands his profession would advise a client to apply for foreign European patents before the publication of his invention in Great Britain, either by working it or by filing the specification. The French law of 1844 distinctly provides that "No invention is held to be new which, either in France or in any foreign country, has received such publication as to allow of its being carried into effect therefrom."—Ed. M. M.]

ON THE CONSTRUCTION OF ARCHES.

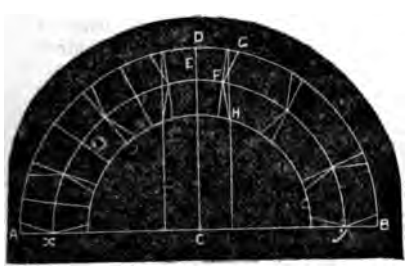
To the Editor of the Mechanics' Magazine.

Sir,—Through the medium of your useful Magazine, let me state a very few words concerning arches, which I flatter myself may be of some use to your readers.

The present mode of shaping the voussoirs of arches is very defective, inasmuch as it only prevents the arch from being pressed downwards, while it in no way, or at least in a very imperfect way, resists upward pressure. Certainly the arch can be loaded, in any part where it is apt to rise; but this mode causes great pressure upon the haunches, and then, of course, stronger abutments are required; or if it be a pier, then it ought to be stronger to resist the increased pressure on each side of it, when this has been done.

The Italian architects, I know, have a way of sloping the soffit of the arch towards the centre, so as to give a larger shoot for the water to pass through; but this, in the case of floods, &c., is often not sufficiently efficacious. The keystone or some other part of the arch is thrust up by the pressure of the water beneath, and consequently the arch falls.

I will now proceed to explain the plan that I think would obviate all these defects, and which would answer equally well for



arches of any shape. Let us take the case of a semicircular arch; A B is the span, and C D the rise; E the key-stone. From the two upper ends of the key-stone let fall two straight lines, which, of course, will be parallel to C D, the rise of the arch; bisect the line of voussoirs by the line, *x y*; now draw the lines, F G, F H, and the lines corresponding to them on the other side, and we get the shape of the proposed key-stone, which, as we can see from inspection, is incapable of sliding either up or down; consequently no loading can be required. We see now that in the key-stone the top-half prevents it from sliding downwards, and the bottom half from sliding upwards; consequently it must remain stationary. By a similar process, as we see in the figure, the voussoirs on either side of the key-stone are so formed that their upper half prevents them from sliding upwards, and their lower half from sliding downwards; and in the two next the opposite of this takes place. It is evident that the arch-stones are related to one another as in the common way, and still remain in equilibrium. Trusting for an insertion of this in your valuable Journal,

I am, Sir, yours, &c.,

J. A. D.

Reading.

THE LUNAR ROTATION.

To the Editor of the Mechanics' Magazine.

Sir,—It is not my intention to renew this discussion in the *Mechanics' Magazine;* my object is principally to thank Dr. Lardner for the candid manner and philosophical spirit in which he has endeavoured to reconcile us to the notion of the moon's rotation. However, I must confess that the communication has had no effect on my mind; on the contrary, it tends to strengthen the conviction of the misconception of applying the term rotation to the moon's motion, and that her turning round is simply caused by her revolving motion, like the tooth of a cog-wheel.

I am happy to observe that Dr. Lardner still maintains that "undoubtedly if rotation be denied to Wyld's great globe, the Peak of Teneriffe and other objects carried round by the diurnal motion of the earth, it cannot be claimed for the moon." Many of the opponents will not allow such comparisons, as they state that it is ridiculous to say that a tooth of a cog-wheel has an axis of rotation in the pitch line. They say any physical connection between the moon and the earth is inadmissible, and cannot be accepted in the argument.

Dr. Lardner is candid and consistent in his attempt to show that revolving objects must necessarily rotate, be they attached or not. Hence all the teeth of a cog-wheel

have not only a central revolving axis common to them all, but also, according to Dr. Lardner, real axes of rotation. I must again repeat, that such an idea is quite incomprehensible to me, and irreconcileable to the ordinary definitions of the terms rotation and revolution. Yet, as Dr. Lardner truly states, if rotation be denied to objects *fixed* to the circumference of a circle, it cannot be claimed for the moon. The majority of the opponents dispute such a comparison, and that the teeth of cog-wheels cannot neces-arily rotate or spin round their individual axes.

Let us take a ball and spin it round on a centre within itself—this motion we call rotation. Such a ball, I presume, could only have one axis of rotation in the same instant of time, round which all the particles of such a ball circulate whilst in motion. This being the case, I cannot conceive how it could be possible to make the objects which may be painted round its circumference to rotate also on their respective axes at the same time. Whether it be a wheel or a sphere turning round on a central axis, if the whole move round as one body, showing the same parts towards the centre of motion, they can only have but one axis common to them all; the particles through which the axis passes rotate, whilst those situated without the axis can only revolve according to the ordinary meaning of that term in dynamics.

I feel obliged to Dr. Lardner for his explanation, as it will enable parties to reduce the argument to the motion of a cog-wheel; viz., one party maintaining that a tooth of a cog-wheel necessarily rotates, besides revolving; the other party say no, that it only revolves.

I am Sir, yours, &c.,
EVAN HOPKINS.

38, Thurloe-square, August 4, 1856.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

WILLIAMS, J. A. *Improvements in machinery or apparatus for cultivating land.* Dated Dec. 7, 1855. (No. 2766.)

This invention relates to certain implements, and framework for carrying the same, such implements answering, by slight modifications, as scarifiers or grubbers, rafter ploughs, horse hoes, and drags.

BESSEMER, H. *Improvements in the manufacture of iron.* Dated Dec. 7, 1855. (No. 2768.)

This invention consists—1. In constructing and applying vessels, partly of metal and partly of loam, fire-brick, or other refractory slow conductor of heat, and mounting them on axes, when forcing currents of air or steam into fluid iron. 2. In employing pipes or passages, or tuyers of fire-clay, or of the materials of which crucibles are formed, for the same operation. 3. In placing the orifices of the passages, pipes, or tuyers so employed below the surface of the fluid metal. 4. In puddling iron in retorts or closed chambers from which the fuel and vapours of the furnace are excluded, and with which air is forced below or on the surface of the fluid metal. 5. In reheating or maintaining at a high temperature in retorts masses of iron that have been treated by forcing currents of air or steam therein when in a fluid state, so as to protect such iron from the action of the atmosphere, and from the injurious vapours of the furnace. 6. In forcing currents of air or steam, or of both, into molten crude iron, or remelted pig, cast, or refined iron, until it is converted into malleable iron, whilst still retaining a fluid state, and the running of such malleable iron into suitable moulds. 7. In manufacturing rods, bars, rails, and plates of malleable iron by hammering or rolling, or both, ingots or masses of iron rendered malleable as described under the 6th head. 8. Founding articles in molten malleable iron obtained as described under that head. 9. In preparing iron for founding purposes by forcing currents of air or steam into and below the surface of such iron while in a fluid state, and then applying a quantity of carbon thereto by forcing carbonaceous matters into it, as described.

HACKING, J. *Improvements in machinery for supplying fuel and air to furnaces.* Dated Dec. 8, 1855. (No. 2772.)

This invention consists—1. In the application of revolving feed rollers having projections placed in a spiral direction for supplying fuel from a hopper to the furnace. 2. In the application of a loose bottom, the position of which can be changed to alter the distance or direction of the fuel supplied on to the grate by a fan or otherwise. 3. In connecting to the strap guide of the cone pulleys by which the feed roller is driven, a lever for moving the slide by which air is admitted to the fire, and a chain for regulating the opening and closing of the damper between the flue and the chimney. 4. In an improved combination of machinery for forcing air and fuel on to or over the fire-grate.

FONROBERT, C. F. J. *An artificial leech and a sucker.* Dated Dec. 8, 1855. (No. 2773.)

This invention consists—1. In constructing an artificial leech with a cylinder and piston, and a lancet to which they communicate motion. 2. In constructing such a leech with a circular or revolving lancet

connected to the piston. 3. In constructing such a leech and a sucker with a catch for securing the piston. 4. In constructing a sucker of a bent tube with a piston and rod provided with a catch.

RADCLIFFE, J., and T. V. FAVELL. *Improvements in machinery or apparatus for cutting sugar and other substances.* Dated Dec. 8, 1855. (No. 2774.)

This invention comprises certain arrangements of machinery; the use of indented cutters for cutting loaf sugar, &c.; certain compound indented cutters, having their cutting edges at right angles to each other; certain apparatus for clearing the cutters after each cut; the use of two horizontal knives in combination with a central transverse fixed vertical knife; certain apparatus for actuating the knives, and apparatus for presenting the sugar, &c., to the knives.

NORTON, W. *Improvements in weaving pile fabrics.* Dated Dec. 8, 1855. (No. 2775.)

This invention relates to the weaving or manufacturing of double cloth from two distinct foundation warps and a separate pile warp, which latter is worked into both foundations or bodies of the double fabric, so that when the intermediate pile yarn so worked in is cut in two, it forms a pile surface for each fabric. It comprehends a plan of keeping the foundation warps asunder by the disposition of the foundation warp beams.

MACLURE, A. *Improvements in lithographic printing presses.* Dated Dec. 8, 1855. (No. 2778.)

The patentee describes an arrangement by means of which steam is applied to the working of the table or bed of the press with the stone thereon.

HALL, J. *Improvements in jacquard looms.* Dated Dec. 10, 1855. (No. 2780.)

This invention consists—1. Of working the box motion direct from the jacquard hook by means of horizontal and vertical levers, so that as the jacquard hook acts upon a horizontal lever it causes a vertical lever to work the shuttle-box. 2. Of working the picker direct from the jacquard hook by similar means. 3. Of using a separate stop rod to each shuttle where more than one shuttle is used. This third part is now disclaimed.

COCKER, J. *Improvements in the manufacture of wire.* Dated Dec. 10, 1855. (No. 2781.)

This invention comprises a method of rendering the annealing operation continuous by heating the wire in an oven, and passing it into a closed chamber or chambers to be gradually cooled; the use of certain polishing or rubbing surfaces; an arrangement for driving the wire blocks or drums of drawing machines in pairs, and the use of antifriction rollers mounted in a revolving frame as a substitute for the fixed bearing pins of whirls for straightening wire.

HEPPLESTON, T., and J. HUNTER. *Certain improvements in machinery or apparatus for stretching and finishing yarns or threads.* Dated Dec. 10, 1855. (No. 2782.)

The patentees employ a hollow cylinder, mounted on framework, and capable of being heated from the interior, and raised or lowered by means of a nut attached to a cross head, through which a screw passes. This cylinder has the hanks of yarn previously passed over it for causing an extra stretch to the yarn, thereby increasing the friction, so that a lustre or finish is imparted to the thread or yarn. The hanks are caused to move by suitable rollers (in the framing) around which they pass.

PARSONS, D. *An improved brake for arresting or retarding at will the motion of locomotive and other engines and revolving machinery.* Dated Dec. 10, 1855. (No. 2784.)

The patentee describes a brake which is lined with wood, and placed against the circumference of the fly-wheel, being worked by steam.

FONTAINEMOREAU, P. A. L. de. *Improvements in obtaining motive power by means of heated compressed air.* (A communication.) Dated Dec. 10, 1855. (No. 2785.)

This apparatus is composed—1. Of a motive cylinder. 2. Of a closed furnace. 3. Of a compressed air receiver or regenerator. 4. Of a force pump. The arrangement cannot be described without illustrations.

BROOMAN, R. A. *Improvements in manufacturing gas from peat, and in treating hydrogen gas, in order to render it illuminating.* (A communication.) Dated Dec. 10, 1855. (No. 2786.)

The inventor first fills a retort with peat, closes it, and heats the furnace containing it to the same temperature as that required for distilling coal. The gas evolved passes into a cylindrical receiver carrying with it the tar, oils, and ammoniacal waters, the greater portion of which becomes disengaged from the gas in the receiver and condensed therein. The gas passes thence into a condenser, in which the tar, oils, and ammoniacal waters which may have escaped the action of the cylindrical receiver are condensed. The gas then passes through purifying and drying apparatus containing pumice stone, coke, or brick impregnated with sulphuric acid. The gas next passes through a regulator, which transmits it regularly into a carburetting retort. In this retort the tar contained in a vessel placed above the furnace is also admitted through a reversed syphon, the lower end of which passes across

the gas admission pipe. The tar becomes decomposed in the retort, and, entering into the gas, carbonises it, and imparts illuminating power thereto. The gas next passes through a chamber in which the tar which may have escaped the decomposing process is collected, and then undergoes a final purification, and passes into the gasometer. Pure hydrogen gas is to be carburetted in a somewhat similar manner to that employed for gas produced from peat.

JENNINGS, J. G. *An improvement in the arrangement of the overflow pipes of baths, wash-hand basins, and other vessels.* Dated Dec. 10, 1855. (No. 2787.)

This invention consists in applying a syphon pipe to the overflow openings or passages of a bath, a wash-hand basin, and any other vessel subject to like consequences of leaving the tap open.

JENNINGS, J. G. *Improvements in connecting earthenware rain pipes and soil pipes of water-closets, and in valve water-closets.* Dated Dec. 10, 1855. (No. 2788.)

For connecting earthenware pipes cast-iron junctions are used. Each junction is cast with an internal rib or projection of the thickness of the pipes, and on the outside there are lugs to fix the junction to part of a building. The junction is fixed in the following manner:—There is a grooving around or near the end of the pipe, so that when the end is introduced into the junction, and melted asphalte or cement is run into the socket between it and the pipe, there will be a good joint formed. In fixing the end of another pipe into the junction, a washer of vulcanized India-rubber is placed on the projection in the junction, and the whole of the surfaces are coated with red lead or suitable cement, and then the end of the other earthenware pipe is introduced, and a sound joint is made.

JENNINGS, J. G. *An improvement in the rising-pipe and suction-valves of pumps.* Dated Dec. 10, 1855. (No. 2789.)

This invention consists in attaching the clack valves to the doors of the valve boxes of the rising pipes of pumps, by which on opening and removing the doors, the valves will come away therewith, and on restoring or refixing the doors, the valves or fresh ones will be put into their places.

HUGHES, B. *A machine for making spokes and tool handles.* (A communication.) Dated Dec. 11, 1855. (No. 2790.)

This invention consists in the use of two rotating cutter heads placed upon a shaft which is fitted or attached to a frame having an up and down movement, the cutter heads being allowed to move laterally upon their shaft, so that the bits or cutters, by means of suitable guides may be moved vertically, *and also laterally,* and consequently be made to act upon the timber, so as to cut spokes, tool handles, &c., of any desired form.

HUGHES, B. *A knot-tying sewing-machine.* (A communication.) Dated Dec. 11, 1855. (No. 2791.)

This invention consists in so arranging and operating the parts of sewing machines, that the thread from the needle, when passed through the material to be sewed, is tied by a half or a whole knot of the shuttle thread, and also in so operating the feed motion, that the thread to be tied shall be tied at the will of the operator by a half or whole knot at any stitch that may be thought necessary, thus providing a seam that will not rip when the thread is cut.

TOLHAUSEN, A. *Certain improvements in mariners' and land compasses.* (A communication.) Dated Dec. 11, 1855. (No. 2794.)

Claims.—1. Making the glass of the compass with a rim to fit over the top or head of the bowl, and providing a ring of any elastic or suitable yielding material between the said rim and the head, whereby rain or other moisture settling on the glass is prevented running into the bowl, and at the same time, the glass is protected against the expansion of the case. 2. Balancing the compass card and needle by attaching thereto a suitable number of rigid arms, provided with weights which screw or slide thereon to move them to or from the centre of suspension.

HORSLEY, J. *Certain means of treating quinine and iodine, and other mineral medicines, in order to cause them to combine with cod-liver oil, or any other fish-oil, or with seed oil.* Dated Dec. 11, 1855. (No. 2795.)

The patentee dissolves the pure alkaloid of either of the cinchona barks known as quinine and cinchonine in cod-liver oil heated to about 140° F., in the proportion of about 2 grains of alkaloid to the ounce. He then triturates with this warm preparation a quantity of iodine (equivalent to ¼ grain for every ounce), till the solution has been effected. He also describes other processes for combining iodide of iron, bromide of iron, &c., with cod-liver oil.

CLIFF, J. *Improvements in or additions to furnaces.* Dated Dec. 11, 1855. (No. 2796.)

This invention consists in certain arrangements of apparatus for regulating the supply of air to furnaces by means of the weight of a liquid, or by a float, piston, or plunger worked by a liquid.

JOHNSON, J. H. *An improved apparatus for discovering the leakage or escape of gas.* (A communication.) Dated Dec. 11, 1855. (No. 2797.)

This apparatus consists of a cylinder with a bed plate for the facility of attachment to a wall, to the lower extremity of which cylinder is fitted a pipe connected to a force

pump. Air is drawn in at one aperture of the pump, and forced into the pipe and cylinder by another, whence it passes to the supply pipes and to two side tubes in connection, the one with a dial pressure gauge, and the other with a mercurial gauge for indicating the pressure in the gas pipes, all the cocks at the burners and meter having been previously closed. Any leakage will be indicated by the hissing of the air through the leaks. In place of forcing air into the pipes, a vacuum may be made therein, the apparatus being worked in a reverse manner to that described.

LEVY, R. *An improvement in wearing apparel.* Dated Dec. 11, 1855. (No. 2798.)

This invention consists in so attaching a waistcoat to a coat that it shall form one garment, yet have the appearance of a coat and waistcoat.

WHYTLAW, R. A., and J. STEVENS. *Improvements in weaving.* Dated Dec. 11, 1855. (No. 2799.)

This invention relates to a self-acting mechanical contrivance for producing an alternate twilling and plain weaving action in power looms, and is applicable in weaving various classes of fabrics. In one modification, as arranged for producing the simplest kind of twilling in combination with plain weaving, four heddles are used, acted upon by four levers, which are depressed by cams on a shaft, which makes a revolution for every four picks of the loom. When the twilling action is required, the four heddle levers are worked separately in the proper rotation for producing the twill; but when the plain weaving action is required, the heddle levers are coupled together in pairs, so that both levers of each pair act whenever the cam of either of them comes round, and thus the four heddles act precisely as if arranged for plain weaving.

NEWTON, A. V. *Improved machinery for manufacturing bolts.* (A communication.) Dated Dec. 11, 1855. (No. 2801.)

This invention comprises—1. A sliding socket for upsetting the head centrally with respect to the shank. 2. Two side punches, operating simultaneously and equally on opposite sides of the bolt, in combination with an intermittent rotary motion of the bolt holder, for finishing the bolt with its centre in the axis of the shank. 3. A forward and backward motion of the bolt holder when a bolt is ejected.

FOROT, A. *Improvements in parasols.* Dated Dec. 11, 1855. (No. 2802.)

This invention consists in arranging a parasol so as to fold into the form of a fan.

CLARKE, S. *Improvements in lanterns for affording light, and for cooking.* Dated Dec. 11, 1855. (No. 2803.)

This invention consists in constructing lanterns, each *with two or more candle* lamps or tubes. Within the cover, and above the candle lamps or tubes, the space is arranged for receiving cooking utensils.

RUDING, R. *An improvement in printing silks and other woven fabrics with gold and other metal leaf or powder.* Dated Dec. 11, 1855. (No. 2804.)

This invention consists in employing shell lac in a refined and powdered state, together with a heated printing surface, for printing silks and other woven fabrics with gold and other metal leaf or powder.

DAVIS, R. W., and D. DAVIS. *An improved vice.* Dated Dec. 12, 1855. (No. 2805.)

This invention comprises—1. The application to a vice of a beam having a ratchet which is engaged by a pawl, and having a spiral faced head or the equivalent thereof, fitted with a loose cap having a corresponding face, &c. 2. An arrangement of crossed levers between the jaws, and their attachment so as to secure to the jaws an uniform leverage.

BILLING, M., and W. G. WHITEHEAD. *A new or improved waterproof fabric or material.* Dated Dec. 12, 1855. (No. 2806.)

Claim.—Making a waterproof fabric or material, by impregnating with marine glue a compound material or fabric made of paper combined with linen or other woven or felted fabric.

BEARDSELL, I. *Improvements in the finishing of mohair cloths and other textile fabrics, and in the machinery employed for that purpose.* Dated Dec. 12, 1855. (No. 2807.)

This invention relates to the mode of forming the raised wool or nap on the surface of mohair cloths or other textile fabrics, so as to form the said wool or nap into circles, semi-circles, curves, or other designs on the surface of the cloth or material. Certain apparatus is employed in which a number or series of such wire cards, or other pointed articles, suitable for raising the wool, are fastened to small blocks mounted on the ends of spindles with small pulleys, whirls, or wheels thereon, to which is given simultaneous rotary motion.

HAY, G. H., and D. S. HAY. *Improvements in photographic pictures.* Dated Dec. 12, 1855. (No. 2808.)

This invention consists in a mode of finishing photographic pictures by working dry or moist colours into a medium previously applied to the pictures whilst such medium is in a moist or undried condition.

MIDGLEY, R., and G. COLLIER. *Improvements in preparing worsted, mohair, alpaca, cotton, and other yarns.* Dated Dec. 12, 1855. (No. 2809.)

These improvements consist in removing the projecting fibres from the yarns by the action of knives, in place of singeing or burning. The patentees employ one knife stationary, the other rotating and of a helical

character, such as is used in shearing the surface of cloths.

LEIGHTON, W. *Improvements in paddle-wheels.* Dated Dec. 12, 1855. (No. 2810.)

This invention was described and illustrated at page 105 of our last Number.

HOLBEN, R. *Improvements in apparatus for chopping barley.* Dated Dec. 12, 1855. (No. 2811.)

This invention consists in employing knives raised up and down by a crank, or other suitable means. These knives descend upon a table on to which the barley is thrown by an endless chain of buckets. The table has a horizontal to and fro movement, which, acting with the knives, throws the barley forward after it has been operated upon.

RICKETT, T. *Improvements in pressure gauges.* Dated Dec. 12, 1855. (No. 2812.)

In this invention two pistons or surfaces of different area are combined, and the steam or other fluid is caused to press on a comparatively small area of a piston or surface, and the mercury or other fluid used for gauging or indicating the pressure on a comparatively large area, by which the height of the measuring column is reduced.

HART, D. *Improvements in signalling or communicating between parts of a railway train, and in the instruments and apparatus employed for such purpose.* Dated Dec. 13, 1855. (No. 2814.)

The patentee's arrangements are such that he only requires one wire, and that is applied in independent pieces affixed to each carriage. He only requires, therefore, one pair of couplings or fastenings between each carriage, and he uses the earth, through the iron work of the carriage, &c., for the return current, and this he is enabled to do by the use of a small sand or other similar battery placed upon the tender, the engine, or in the guard's van. He has a wheel contact-maker or breaker fitted in the guard's van, with signals or directions similar to and corresponding with those upon a dial instrument fixed upon the engine.

POITEVIN, A. L. *Improved photographic printing.* Dated Dec. 13, 1855. (No. 2815.)

Claims.—1. A mode of printing in the manner of lithography, by moistening and inking with a greasy ink a lithographic stone, or other suitable surface, prepared with chromatized albumen, fibrine, gum, gelatine, or similar organic substance, on which a photographic impression or effect has been produced. 2. A mode of printing upon paper, cloth, &c., by applying to them a mixture of liquid or solid colours with chromatized albumen or other organic matter, and exposing to light; and afterwards washing away those portions of the mixture *which have not been acted* upon by the light.

POITEVIN, A. L. Improved photographic engraving. Dated Dec. 13, 1855. (No. 2816.)

Claims.—1. The application of a plate of glass or other suitable surface coated with a solution of gelatine which is allowed to set or solidify, and is immersed in or exposed to the action of a solution of bichromate of potash, or other chromate whose base does not produce an insoluble compound with gelatine. 2. The application of a plate or surface coated with a mixture of gelatine and bichromate of potash, or other suitable chromate, in either case without the addition of nitrate of silver. 3. The application of a solution of protosulphate of iron to the surface of the photographic gelatine engraving before pouring the plaster upon it, in the process of taking a plaster cast from the gelatine. 4. A certain described mode of metallizing the surface of the gelatine before submitting it to the electrotype process.

JOHNSON, J. H. *Improvements in apparatus for containing and distributing aëriform fluids under pressure.* (A communication.) Dated Dec. 13, 1855. (No. 2820.)

The improved apparatus is composed of two distinct parts—a receiver and a distributor. The receiver which contains the compressed air or gas, and supplies the same to the distributor which conveys it to the engine at a constant pressure, consists of a number of tubes closed at their ends, and opening by branch pipes, fitted with stop cocks, into a chamber in which is fitted the main pipe which leads to the distributor. This latter apparatus consists of a strong vessel communicating at the bottom with the pipe, which leads from the chamber before referred to, whilst at one side is cast a branch pipe, to which is attached the pipe leading to the engine. The top of this cylinder is hermetically closed by a strong cover fitted with a stuffing-box, through which passes an internal rod connected with certain valves, &c., by which the apparatus is rendered self-acting.

JOHNSON, J. H. *Improvements in apparatus for containing compressed air or gases, and in the application of the same to the obtainment of motive power.* (A communication.) Dated Dec. 13, 1855. (No. 2821.)

This apparatus consists of receivers arranged between the generator of the compressed air or gases and the prime mover, and connected with the generator at their upper sides by a pipe leading thereto; an extension of this pipe conducts the compressed air or gas to the prime mover. The lower portion of the receiver communicates by a pipe with a tank or water reservoir placed above the receivers, whereby a constant head pressure is obtained. Stop cocks are fitted into the pipes, and so

arranged that the communications may be either opened or closed between the receivers and the generator, prime mover, and water reservoir.

NICOLL, G. H. *Improvements in fire-places or heating apparatus.* Dated Dec. 13, 1855. (No. 2822.)

This invention consists in a mode of constructing domestic fire-places or grates, so that the cage or grate for the fuel projects from a flush or nearly flush surface, the smoke passing off beneath a hood or canopy above such grate, and through a passage opening beneath the head or canopy. Also in a mode of constructing them with the cage or grate for the fuel projecting from a flush or nearly flush surface, and with air passages behind the grate, and adjacent to the parts heated by the fire, for the purpose of heating air wherewith to supply the room, the air entering the passages below, and issuing from the upper part of the fire-place.

FRIEND, J. W. *An improved registering leg and deep sea lead.* Dated Dec. 14, 1855. (No. 2823.)

This invention consists—1. Of an apparatus for registering the speed or distance run by a ship. The patentee causes an instrument to be constructed with metallic wings presented obliquely to the water, so that they may press the case or instrument constantly downwards in the water, and keep it submerged. A small float or paddle-wheel connected through the intervention of wheels to graduated wheel-plates and dials, is caused to revolve through the resistance of the water travelling through it; each revolving wheel-plate or dial presenting the graduated scale or numeral corresponding to the distance run. 2. Of a deep sea lead consisting of modifications of the above self-registering apparatus employed for ascertaining the depth or number of fathoms in which the ship or vessel may be sailing.

KRUPP, A. *Improvements in railway and other wheels, and in the method of, and machinery for, manufacturing the same.* Dated Dec. 14, 1855. (No. 2825.)

This invention consists—1. In forming the interior part of wheels, together with their naves, of one piece of solid wrought iron, and without welding. The inventor forms, by forging and welding together several pieces or layers of iron, a lump or blank of sufficient diameter and thickness to yield the required disc and nave. He then heats these lumps or blanks in a suitable furnace, and subjects them to repeated blows of a hammer to prepare them for the rolling process. 2. Of a rolling process where the blank is formed into a complete disc and nave. The method employed for uniting the tires to the disc may be either by a flange formed in the inside of the tire, the disc being bolted or riveted thereto, or by a separate ring of angle iron bolted or riveted to the disc, and the tire then shrunk or bolted on the ring of angle iron; or by any other approved method.

BOUSFIELD, G. T. *Improvements in machinery for the manufacture of cut-pile fabrics.* (A communication.) Dated Dec. 14, 1855. (No. 2826.)

Claims.—Organising and combining the parts of a loom for making two piled fabrics at the same time, in such manner that the two shuttles used may (in place of being fly-shuttles as heretofore) have a positive mechanical motion given to them when they are being passed from side to side of the loom; the use of pile wires when weaving two fabrics simultaneously in looms wherein positive motion is given to the shuttles; the combined use of cams for operating the positive motions of the shuttles, for inserting and withdrawing the pile wires, and for actuating the lathe; a method of raising and lowering the reed, and the keeping of it vertical, or nearly so, when beating up the two fabrics therewith; and the use of rotary cutters in combination with take-up rollers for dividing the two fabrics.

TODD, C. J., and R. PINKNEY. *A balance pen.* Dated Dec. 14, 1855. (No. 2827.)

This invention consists in fitting pens with a projecting collar, which will keep the pen from soiling the article upon which it is laid.

WHITEHOUSE, E. O. W. *Improvements in apparatus for measuring fluids.* Dated Dec. 14, 1855. (No. 2828.)

The patentee describes an apparatus in which a paddle-wheel is made to rotate by the action of the fluid to be measured inside an annular chamber of uniform area throughout; and also an apparatus in which the capacity of the measuring drum or wheel itself constitutes the measuring power of the meter.

HAWORTH, P., and A. FORREST. *An improvement in the manufacture of belts, bands, braces, and other similar articles of wearing apparel.* Dated Dec. 14, 1855. (No. 2829.)

This invention consists in the use of a portion of elastic webbing or other elastic material, in connection with leather or other non-elastic belts, bands, braces, &c., thereby imparting to them the similar advantages to the entirely elastic belts, &c.

NEWMAN, W. H. *An improved fire-lighter.* Dated Dec. 15, 1855. (No. 2830.)

This improved fire-lighter is built up in the form of a frustum of a cone or of a pyramid, so that a current of air may pass up through the interior of it.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

HOUT, H. J. VAN DEN, and E. BROWN. *Improvements in utilising leather shavings.* Dated Dec. 7, 1855. (No. 2771.)

The inventors wash leather shavings, spread them in layers on metal surfaces with coats of paste (formed of rye flour and glue, or otherwise) between the layers, turn the sheet so prepared over upon flannel, compress it in a powerful press, and then press it through rollers.

TEVINDALE, A. *Improvements in propelling, and in the construction of steam or other vessels.* Dated Dec. 8, 1855. (No. 2776.)

The vessel, instead of floating in the water, rests on a framework, under which are fitted two or more water-tight drums or cylinders, the air in which supports the whole. Rotary motion is communicated to the drums or cylinders (in which there are radial boards) by a steam engine or other apparatus in the vessel.

DEVOS, F. *Improvements in preparing and tanning hides and skins.* Dated Dec. 8, 1855. (No. 2777.)

The inventor describes a method of soaking the skins and hides (if dry) in a lukewarm solution of chloride of sodium, hydrosulphuret of soda, bicarbonate of soda, or carbonate of lime; shaving them upon a horse with a tool resembling a plane; coating them with a composition of hydrosulphuret of soda, hydrate of lime, pipeclay, and water; cleaning, washing, and renewing the flesh; softening them in a bath containing phosphoric or phosphorus and nitric acid; and squeezing and washing them; after which they are prepared for a tanning process described at length.

WRIGLEY, J., and J. NORCLIFFE. *Improvements in shuttles, and in the method of using the same.* Dated Dec. 10, 1855. (No. 2779.)

Instead of one peg to hold the cop, the inventors propose to have a peg at each end of the shuttle, by which they are enabled to use two cops at the same time, and thus weave two picks at once. They bring the two ends of weft, either through the same eye, or make two eyes for the purpose.

JOHNSON, J. H. *Improvements in the manufacture of safety-paper.* (A communication.) Dated Dec. 10, 1855. (No. 2783.)

This invention consists in employing a solution either of iodide of potassium, ammoniacal sodium, or bromides of the same base equally ammoniacal, or any salts or compounds containing, either in combination or separately, iodine or bromine.

BOUET, R. S., and H. E. I. DOUEIN. *Improvements in the preservation of meat and other animal substances serving for food.* Dated Dec. 11, 1855. (No. 2800.)

This invention consists in coating the substances to be preserved with collodion, either alone or mixed with other suitable materials.

ROBERTS, J. *Improvements in machinery for moulding bricks and tiles.* Dated Dec. 13, 1855. (No. 2813.)

In this invention there are at intervals, in a circular track, separate sets or series of moulds fixed. Each mould has within it a piston or moveable bottom, which, when the clay or brick earth is introduced into the mould, is in the lowest position. Heavy rollers are made to revolve around the circular track and to press on the clay or brick earth, and when they have pressed the clay into a series of moulds, in passing over the end of a lever (to which all the pistons of the series of moulds are connected) they cause the lever to raise the whole of the pistons of such series, and thus lift the bricks or tiles above the upper edges of the moulds, to be removed by hand.

MURDOCK, J. *A process for separating the oleine from the stearine of fatty and oleaginous bodies, and for the extraction of oil from oleaginous grains and from olives.* (A communication.) Dated Dec. 13, 1855. (No. 2817.)

This invention consists in separating the above substances by means of a centrifugal machine; the fluid parts escape into a receiver, and the solid are left behind.

SKELTON, G. *An improved projectile.* Dated Dec. 13, 1855. (No. 2818.)

This improved projectile consists of an elongated cast-iron case or shell, with a convex base, and the smaller end made tapering, so as to decrease in size one-third of its entire length, upon the periphery of which is formed a spiral groove. Within the smaller end of the projectile is secured a brass tubular box or bush, and in the lower portion of this are formed three conical cavities or vent holes, the opening of each being within the body of the projectile, and next to the powder. Upon the inner surface of the lower portion of the box or bush the percussion cap or detonating powder is placed; a plug or bolt is then screwed into the tubular cavity of the box or bush, the upper portion of the latter being tapped for receiving a corresponding thread upon the plug or bolt to prevent accident. The inventor next inserts a pin in the head of the bolt or plug, so as to rest upon the shoulder of the box or bush, and retain it until the shell is required for use, when the pin must be withdrawn. To exclude moisture, a cast-iron cap is fitted over and screwed to the box or bush, so as to enclose the parts immediately in connection with

the explosive compounds, but which may be removed before the projectile is placed within the gun.

LITTLE, J. *Improvements in heating and cooking apparatus.* Dated Dec. 13, 1855. (No. 2819.)

The inventor describes certain apparatus in which one cylinder is placed within another. The fire and flue are within the outer cylinder, the former being below and the latter surrounding the inner cylinder.

PHILIPPI, W. *Improvements in coating iron with tin.* Dated Dec. 14, 1855. (No. 2824.)

This invention consists in excluding the air from the molten tin by means of a chloride of zinc in lieu of grease.

CLAYTON, L. *Improvements in machinery for dressing yarn.* Dated Dec. 15, 1855. (No. 2831.)

This invention consists in the application to the ordinary yarn-dressing machines of a revolving guide roller, furnished with metal rulers, over which the yarn passes before it is carried round the usual heated tin drum; also in the application of a brush for cleaning the surfaces of the metal rulers. These rulers keep the yarn free from lumps of size.

PROVISIONAL PROTECTIONS.

Dated July 15, 1856.

1658. Jean Louis Lucas and Albert de Briges, chemists, of Paris, French empire. Improvements in preparing certain liquid or solid alimentary substances from the husk of a certain fruit.

Dated July 16, 1856.

1668. William Schmidt and Edward Schmidt, of the firm of Schmidt and Co., of Heidelberg, in the Grand Duchy of Baden. An improved balance for weighing.

1670. Henry Turner, of Leeds, York, leather merchant. Improvements in cutting hides for making flexible pipes and for certain other purposes.

1672. Alfred Vincent Newton, Chancery-lane, Middlesex, mechanical draughtsman. Improved apparatus for obtaining rotary motion. A communication.

1674. Thomas Duncan, of Liverpool, Lancaster, civil engineer. A combined and compound engine for applying motive power, and for measuring fluids.

1676. Duncan Cameron, of Glasgow, Lanark, N. B., engineer. Improvements in cranes or lifting and lowering apparatus.

1678. George Eskholme and Henry Wilkes, both of Rotherham, York, engineers. Improvements in ball cocks and cocks in general for drawing off fluids.

Dated July 17, 1856.

1680. Charles Barlow, of Chancery-lane, London. An improved surveying instrument. A communication.

1681. Henry Bragg, the younger, of Belfast, Antrim, Ireland, commission agent. Improvements in drying air, and in machinery for stretching, drying, and finishing fabrics.

1682. Frederick Andrew, of Manchester, dyer, and Samuel Forsell, of the same place, manager. Certain improvements in machinery or apparatus for sizing, stiffening, dressing and polishing yarns and threads.

1684. Reverend George Jacque, of Auchterarder, Perth, N. B., clerk. Improvements in the construction of stringed musical instruments.

1685. Ebenezer Seymour, of Bloomfield, New Jersey, United States of America, gentleman. Improvements in the construction of furnaces. A communication.

1686. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improved regulator for heating apparatus. A communication.

1687. Charles Carey, of Bessborough-street, Pimlico, Middlesex. Improvements in the vessels and filters used for making infusions of coffee and other substances.

Dated July 18, 1856.

1689. Samuel Jay and George Smith, both of Regent-street, Middlesex. Improvements in the manufacture of skirts, petticoats, mantles, and such like articles of ladies' dress.

1692. George Frederick Hipkins, of Birmingham, Warwick, manufacturer, and John Britten, of the same place, engineer. Improvements in applying springs or weights for the purpose of closing doors or resisting shocks, strains, or pressure.

1693. John Cowley, of Quenington, Gloucester. Improvements in the manufacture of paper from straw and other vegetable substances.

1694. Peter Hubert Desvignes, of Lewisham, Kent. Improvements in machinery for scutching or beating flax, hemp, and other fibrous materials requiring like treatment.

1695. Jean Gerber, of Mulhouse, France, chemist. Improvements in printing, dyeing, or impregnating fabrics, yarns, and threads, and in preparing metallic and other powders to be used for these purposes.

1696. William Beevers Birkby, of Upper Rawfold's Card-works, Cleckheaton, near Leeds. Improvements in filleting and fixing pointed teeth in the fillets used in the preparation of flax, tow, hemp, and other fibrous substances.

1697. John Hamilton, junior, of Liverpool. An improvement in the bending of sheet iron for the manufacture of conical tubes.

Dated July 19, 1856.

1698. William M'Master, of Manchester, Lancaster, agent, and James M'Master, of the same place, salesman. An improved apparatus for retaining and releasing cords of window-blinds, or cords, bands, or chains employed for other purposes.

1699. George Hopper, of Houghton-le-Spring Iron Works, Durham, engineer. Improvements in railway pins or spikes.

1700. John Armour, of Kirkton Bleach Works, Renfrew, N. B., bleacher. Improvements in bleaching, washing, or cleansing textile fabrics and materials.

1701. James Lawrence Crockett, of West Ham, Essex, manufacturer. Improvements in evaporating. A communication.

1702. William Noton, of Oldham, Lancaster, manager. Certain improvements in self-acting mules, and other machines of the like nature, for spinning and doubling.

1703. James Ryder, of Bolton-le-Moors, Lancaster, auctioneer, and Daniel Bentley, of the same place, millwright. Improvements in machinery and apparatus for folding and measuring fabrics.

1704. William Stettinius Clark, of Warwick-street, Charing-cross, Middlesex, gentleman. Improvements in machinery or apparatus for digging,

pressing, and moulding peat. A communication from A. Fitts.

1705. James Lawrence Crockett, of West Ham, Essex, manufacturer. Improvements in the manufacture of sulphuric acid. A communication.

1706. John Whitehouse, jun., of Birchall-street, Birmingham, Warwick, brass-founder. Certain improvements in making, mounting, and spindling knobs, applicable for doors and other purposes.

1707. William Astbury Jump, of Moulton, near Northwich, Chester, salt manufacturer. Improvements in the manufacture of salt.

1708. William Astbury Jump, of Moulton, near Northwich, Chester, salt manufacturer. Improvements in apparatus for supplying with fuel the furnaces of steam boilers and other furnaces, and in the method of cleaning the fire bars thereof.

1709. John Smith, of Oldham, Lancaster, and Enoch Harrison, of Manchester, manufacturers. Improvements in machinery or apparatus for warping and beaming.

1710. Edward William Young, of Maidstone-road, Rochester, Kent, civil engineer. Improvements in the construction of bridges.

1711. William Papineau, of Harrowbridge, Stratford, manufacturing chemist. An improvement in the production of spirits of wine.

1712. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. An improved method of supplying air to gas and other lights. A communication.

1713. Henry Jeremiah Iliffe and James Newman, of Birmingham, Warwick, manufacturers. Improvements in the manufacture of buttons.

Dated July 21, 1856.

1714. James Warren, carpenter, John Jones, gentleman, and Benjamin Crowther, gentleman, all of the Clapham-road, Surrey. An improved churn.

1716. Marc Antoine Augustin Gaudin, chemist, and Eugène Xavier Choumara, clerk, both of Paris, France. Manufacturing factitious wholesome milk.

1718. John Pursloe Fisher, of Edgebaston, near Birmingham, Warwick. Improvements in cues used at billiards, bagatelle, and other similar games.

1720. Robert Richardson, of Great George-street, Westminster, civil engineer, and Jonathan Edwin Billips, of Llanelly, South Wales, railway contractor. Improvements in the permanent way of railways.

1722. Frederick Simpson, of Redhill, Surrey. An improved mode of stopping bottles.

1724. William Green, of York-street, City-road, Middlesex. Improvements in treating, ornamenting, and waterproofing fabrics, and in machinery or apparatus for effecting the same.

1726. Samuel Statham, of Islington, Middlesex, gentleman, and Edward Orange Wildman Whitehouse, of Brighton, Sussex, surgeon. An improvement in the arrangements for, or working of, electric telegraphs.

Dated July 22, 1856.

1728. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improvements in machinery for reaping and mowing. A communication from W. H. Hovey.

1730. Samuel Colman, of Norwich, manufacturer. Improvements in steam boilers.

1732. Charles Cowper, of Southampton-buildings, Chancery-lane, Middlesex. Improvements in lighting and extinguishing gas lights. A communication from S. Petit, France.

1734. Henry Hindle, of Cavendish-street, Ashton-under-Lyne, Lancaster. Improvements in valves and apparatus for governing steam engines, and for increasing the safety of steam boilers.

1736. John Imray, of Bridge-road, Lambeth, Surrey, engineer. Improvements in bending timber.

Dated July 23, 1856.

1738. John Brayshay, of Cinderhill, Ringley-bridge, near Bolton-le-Moors, Lancashire. Certain improvements in boilers for generating steam.

1746. Giles Mabie, of Rockford City, Winnebago County (State of Illinois), in the United States of America. Improved machinery for mowing and reaping. Partly a communication.

1750. John Webster, of Moreton-terrace, Pimlico, Middlesex. Improvements in distilling and treating rough turpentine and resinous matters.

1752. Pierre Charles Prévôt, of Agen, France. An improved railway break.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

1742. John Onions, of Wellington-place, Blackfriars-road, Southwark, Surrey, engineer. Improvements in the manufacture of iron. Dated 23rd July, 1856.

1792. Robert Thatcher, of Oldham, Lancaster, cotton spinner. Certain improvements in preparing for doubling or spinning cotton or other fibrous substances. Dated 29th July, 1856.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," August 5th*, 1856.)

673. W. Brierley and J. P. Brierley. Improvements in looms for weaving.

727. W. Clayton. An improved manufacture of soap.

733. R. D. Cumming. A foot-stool and hassock combined. A communication.

734. B. F. Brunel. Improvements in the manufacture of Prussian blue.

743. W. Ward. Improvements in apparatus for lubricating the spindles of certain machines used in preparing and spinning.

746. J. Charritle and W. Smith. Improvements in the manufacture of small shot. A communication.

755. F. Puls. Improvements in galvanic batteries.

756. J. J. Rippon. An improvement or improvements in rollers or cylinders for printing fabrics.

768. C. D. Gardissal. Certain improvements in machinery for sweeping streets and other ways. A communication.

769. J. Hicks. Improvements in stoves.

772. H. Henderson. Improvements in stop-cocks or valves.

778. G. T. Smith and J. Watts. An improved lubricator.

790. F. Grice. New or improved machinery for the manufacture of bolts, rivets, spikes, screw blanks, and nuts.

802. A. V. Newton. Improvements in the construction of rotary steam engines, applicable in part to pumps for raising and forcing fluids. A communication.

811. J. Bannehr. An improvement in manufacturing or preparing paper for, and in mounting copies of, written documents thereon.

825. J. Webster. A new or improved elastic metallic tube, and the method of manufacturing the same.

885. G. Davies. Improvements in the method of soldering or uniting cast iron. A communication.

893. A. V. Newton. Improved machinery for felting hat bodies. A communication.
894. A. V. Newton. An improved mode of constructing grate bars. A communication.
960. A. V. Newton. A new method of obtaining purified oil from coal, shale, and other bituminous substances. A communication.
962. J. Yeomanson and W. Yeomanson. Improvements in the manufacture of knitted fabrics.
1007. G. Napier and J. Millar. Improvements in the manufacture of gas from coal, tar, or other bituminous, resinous, or fatty matter.
1089. T. Restell. Improvements in fittings or appendages for doors, and in the means of fixing or attaching the same.
1042. W. Naylor. Improvements in power hammers and riveting machines, parts of such improvements being applicable to the manufacture of bolts or rivets.
1128. W. E. Newton. Improved apparatus for generating illuminating gases from coal or other substances. A communication.
1152. H. Greaves. Improvements in the permanent way of railways.
1202. J. Cope. An improvement or improvements in the manufacture of buttons made of pearl or other shell, ivory, bone, or wood.
1225. T. Morris. An improved trap for beetles and other insects.
1248. R. Harlow. Improvements in the construction of water closets, and in valves or taps for water closets, and other purposes.
1424. J. Davies. A new or improved method of manufacturing the small coke commonly called breeze, which said method of manufacture economises heat and effects the suppression or partial suppression of smoke.
1462. E. R. Handcock. Certain improvements in mechanism connected with engines to be worked by steam or other motive power.
1484. L. Bower. An improvement or improvements in the manufacture of bolts, rivets, spikes, screw blanks, nuts for screws and washers.
1542. J. L. Davies, jun., and J. Broadbent. Certain improvements in umbrellas and parasols.
1560. W. H. Burnett. Improvements in electric telegraphs, and in apparatus employed therein.
1578. J. Lewtas and J. Humphreys. Improvements in apparatus for holding and releasing cords, chains, bands, or bars.
1582. T. Smith. Improvements in horse rakes.
1638. R. Harrington. Improvements in umbrellas, parasols, walking sticks, whips, &c.
1648. J. Pope. Improvements in the application of steam power to ploughing and other agricultural purposes.
1658. J. L. Lucas and A. de Briges. Improvements in preparing certain liquid or solid alimentary substances from the husk of a certain fruit.
1676. D. Cameron. Improvements in cranes or lifting and lowering apparatus.
1678. G. Eskholm and H. Wilkes. Improvements in ball cocks and cocks in general for drawing off fluids.
1689. S. Jay and G. Smith. Improvements in the manufacture of skirts, petticoats, mantles, and such like articles of ladies' dress.
1701. J. L. Crockett. Improvements in evaporating. A communication.
1705. J. L. Crockett. Improvements in the manufacture of sulphuric acid. A communication.
1712. R. A. Brooman. An improved method of supply air to gas and other lights. A communication.
1732. C. Cowper. Improvements in lighting and extinguishing gas lights. A communication.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1853.
1775. James Edward M'Connell.
1779. William Thomas Henley.
1789. John Carvalho De Medeiros.
1822. George Armitage.
1823. Charles Butler Clough.
1825. Thomas Moss.
1829. William Smith and Thomas Phillips.
1831. William Smith and Thomas Phillips.
1843. Robert Morrison.
1852. William Rowan.
1887. Richard Archibald Brooman.
1897. John Perkins.

LIST OF SEALED PATENTS.

Sealed July 29, 1856.

1856.
390. Edouard Deiss.
392. Alexandre Tolhausen.
396. Eddlestone Elliott, Cyrus Leach, and James Ratcliffe.
456. James Griffiths.
474. Louis Normandy.
525. William Crozier.
678. John Jones and Alexander Cunningham Shirreff.
786. John Gray.
787. Alfred Vincent Newton.
922. William Westley.
1111. John Ridal.

Sealed July 31, 1856.

257. Henry Holford and Mark Mason.

Sealed August 1, 1856.

311. Theodore Bergner.
321. John Fletcher and William Fletcher.
327. James Edward Duyck.
431. John Freer.
435. Jeremiah Clark and James Austin.
447. James Durell Greene.
459. Georges Toucas.
499. Peter Armand Lecomte de Fontainemoreau.
505. Thomas Taylorson Jopling.
567. Auguste Neuburger.

Sealed August 5, 1856.

318. George Napier and John Miller.
328. Charles Frederick Philipp Funcke.
364. Louis Vignat.
368. William Gilchrist.
370. William Edward Newton.
374. Gustave Louis Keller.
378. Henry Robert Ramsbotham and Willam Brown.
398. William Edward Newton.
406. James Strang Thomson and Andrew Barclay.
494. Richard Archibald Brooman.
548. Richard Archibald Brooman.

570. John Downie.
931. George Thompson.
998. Thomas Hill.
1076. Louis Guillaume Perreaux.
1088. Alfred Vincent Newton.
1150. James Leck and Alexander Miller.
1252. Alphonse René Le Mire de Normandy.
1266. Frank Clarke Hills.
1326. Frederick Albert Gatty.
1350. Charles Durand Gardissal.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

J. Starling.—The only course you can pursue is to address a letter containing a statement of the facts you allude to, to one or more of the morning newspapers.

J. D. P.—The best electro-magnetic engine with which we are acquainted is Mr. T. Allan's, which was described in this Magazine, vol. lx., p. 265, No. 1598. Dr. Lardner describes some of the best of the French engines of this class in the last volume of his "Handbook of Natural Philosophy," just published (price 5s.) by Messrs. Walton and Maberley, Ivy-lane (*see wrapper*).

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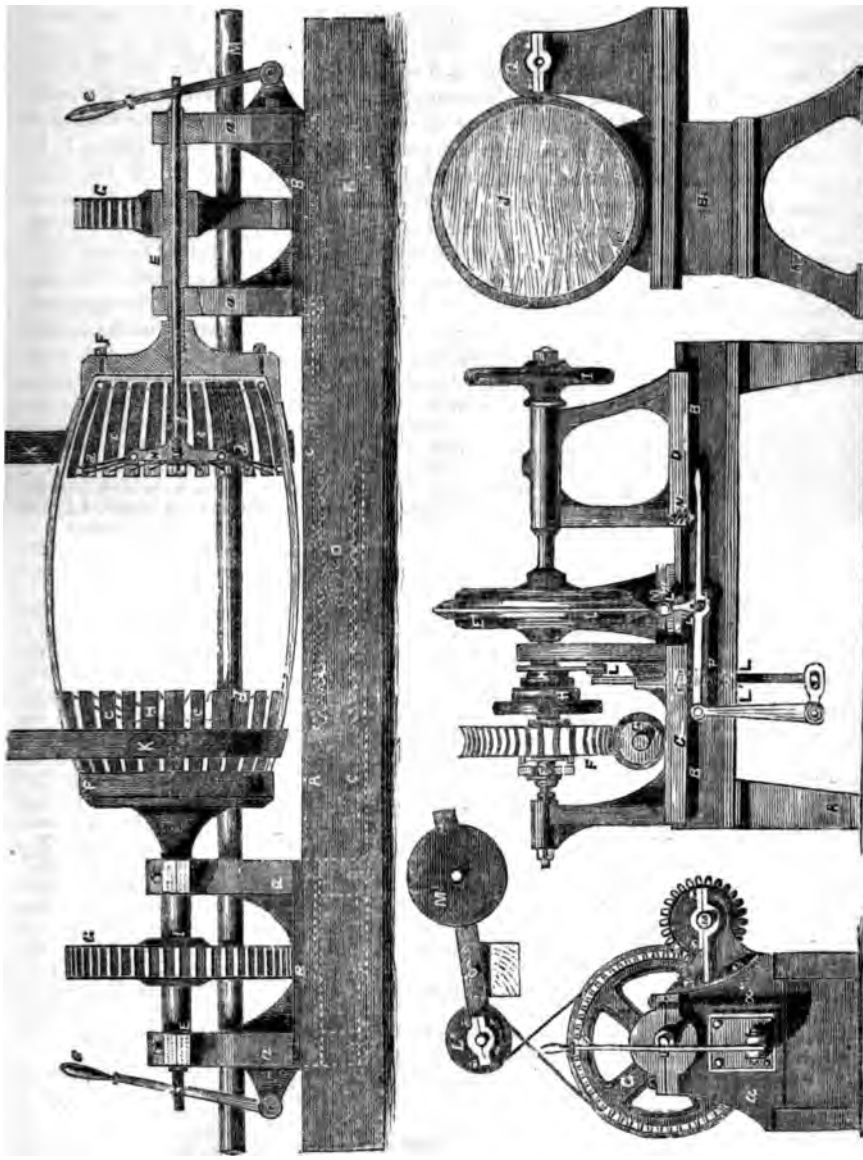
LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1723.] SATURDAY, AUGUST 16, 1856. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

GRIST'S PATENT CASK-MAKING MACHINERY.



GRIST'S PATENT CASK-MAKING MACHINERY.

(*Concluded from page* 124.)

It is well known that when staves are shaped and bent, it is difficult to "raise" or put them together into casks by hand. It was for this cause that Mr. Grist invented the machine shown in figs. 6 and 7, by means of which any unskilled person can put a cask together in a few minutes, supposing the staves to have been prepared by the machinery already described, which insures their proper radius and curvature with the greatest nicety. Fig. 6 is a front elevation, and fig. 7 an end elevation. A is the bed; B B, two frames free to slide to and fro simultaneously when acted upon by the racks, C C, connected to them and the pinion, D. *a a* are standards, in which are bearings for the hollow shafts, E E. At one end these shafts are connected to heads or dished plates, F F; G G are toothed wheels geared into by pinions, L (one of which only is seen in the cuts), upon the shaft, M. *c c* are a series of ribs, the outside of each of which is curved to the internal curve of the description of cask to be raised. The inner ends of the ribs are connected to ring bolts attached to the heads, F F, or are otherwise hinged thereto. The opposite ends of the ribs are connected through stretchers, *d d*, to discs or plates, H H, upon the inner ends of two shafts, I I, inserted through the hollow shafts, E E. The outer ends of these shafts are connected to hand levers, *e e*, whereby the shafts may be moved inwards or outwards in order to expand the ribs, or to cause them to close in towards each other. K K are two belts passing round the outside of the ribs and over pulleys, L′, one of which only is seen in the cut. These pulleys are fixed on the ends of levers, which have a counterpoise, M′, in order to keep the belts in a state of tension. In order to raise a cask, the frames, B B, are brought towards each other, and the ribs are expanded, as shown in fig. 6. Staves are inserted between the belts and the ribs, and the heads and frames are caused to rotate through the pinions, L L, and wheels, G G, until sufficient staves have been inserted to form the intended cask; truss hoops are brought round the staves; the shafts, I I, and heads, H H, are drawn back, whereby the outer ends of the ribs will be drawn towards each other to such extent as to pass out from the staves. The frames are slidden back by the racks and pinion free of the staves, which are then rolled away ready to be chimed and creused for receiving the cask heads.

We have not space to illustrate the machinery employed for chiming and creusing, and therefore pass on to describe the machinery by which the heads of casks are cut. Fig. 8 is a front elevation of a lathe; and fig. 9 an end elevation, partly in section. A A are the standards; B, the bed; C, the head; D, the back poppet; E E, the face plates; F, a worm wheel; G, a worm taking into the worm wheel, F; and H, a set of cone pulleys for quick speed. The worm wheel, F, is loose upon the mandril of the lathe, so that it may be thrown into and out of action when required by the clutch box, F′. I is a hand wheel which forces the face plates together by means of a screw, and causes them to hold the head, J, of the cask tight. K is a cam upon the mandril of the lathe; and L L′ L″ L‴ are levers, by means of which the cam, K, acts upon the slide rest, M, or upon the turning tools when these are employed. N is a spiral spring, which keeps the lever, L″, in contact with the lever, L‴. Between the cam, K, and the lever, L, a small friction roller, O, is interposed, and this roller is kept in contact with the cam by means of a spiral spring, P. The operation of this machine is as follows:—The cask head, J, is placed between the face plates, E E, and secured by the hand wheel, I, and then by a strap band from the prime mover, the worm, G, and therefore the worm wheel, F, the head, J, of the cask, and the cam, K, are caused to rotate. By the motion of the cam, K, and the levers, L L′ L″ and L‴, a rectilinear or reciprocating motion is imparted to the slide rest, M, on which are mounted the cutters. These cutters are thereby caused to approach to and recede from the head, J, as it rotates, and thus impart to it the necessary elliptical form. The cutters themselves receive a rapid rotary motion about their own axes by means of a driving pulley and are set to the sectional form required for the head of the cask.

It should be stated that a very important feature of the machinery described is, that by it casks of any size can be manufactured.

SUGGESTIONS ON THE RE-BUILDING OF COVENT GARDEN THEATRE.

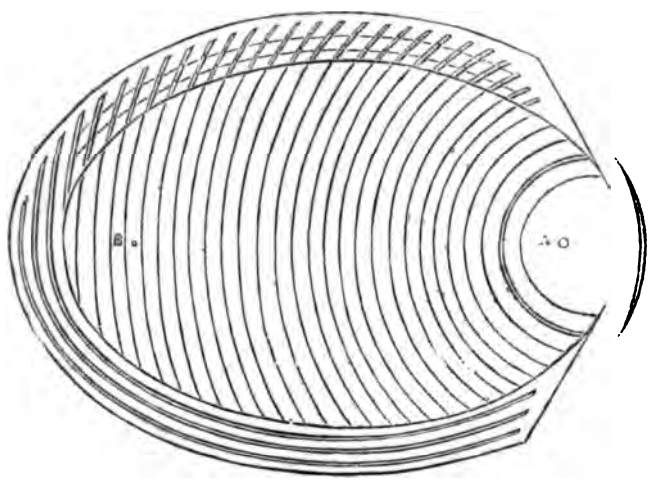
BY SIR G. CAYLEY, BART.*

SIR, — Since the lamentable accident that has so lately happened to the Covent Garden Theatre, the frequent occurrence of that event to my thoughts has led me to speculate upon the various improvements that might be made in the construction of theatres. I have taken the liberty of inclosing you the following plan and hints, which I conceive to be worthy your attention, inasmuch as they state undoubted principles, which local convenience may more or less permit to be put in practice, but without an attention to which, no theatre can be pronounced well constructed.† The science of acoustics is perfectly well understood, and the inclosed rough sketch of the internal plan and elevation of a theatre is modified to the principles of that science in conjunction with giving the greatest possible convenience of sight to the largest number of people the space can contain.

It is the property of an elliptical room to collect all the sound uttered in one of its foci into the opposite focus by reflection; hence, as the ellipsis is a very beautiful curve, and as it is only the parts of a theatre distant from the stage that require the aid of reflected sound, I have adopted this figure as the ground plan; fig. 1, will show. Here any voice uttered upon the stage at A would be concentrated at the point B, excepting what is absorbed by entering the side boxes.

I have drawn the stage semicircular, and

Fig. 1.



on one side arranged the seats concentrical with it. This I conceive would be a mate-

* The above letter, though written nearly fifty years ago, is so applicable to the present time, that, at the suggestion of the writer, we have extracted it from *Nicholson's Journal* of 1809, with the hope that it will receive the attention of the architects of the new theatre about to be erected. It was addressed originally to Mr. John Kemble, September 25, 1808.—ED. M. M.

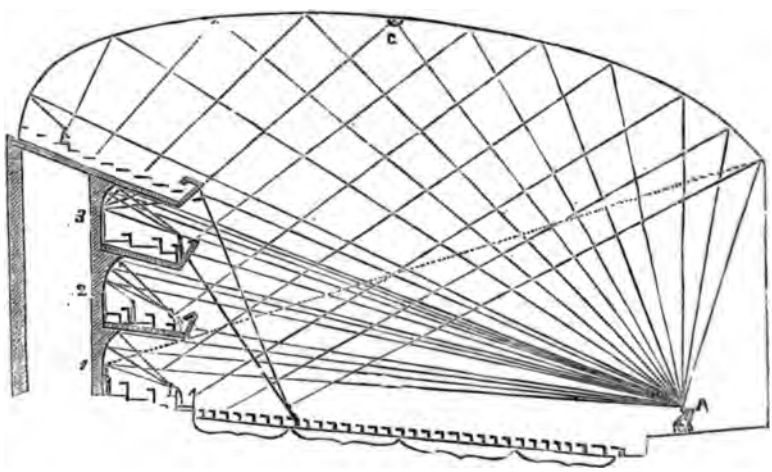
† In a letter to Mr. Nicholson, the editor of the *Journal* from which this letter is taken, Sir George says:—"The ancients bestowed great pains upon their theatres, and they are certainly an object of considerable importance in society. I conceive there can be no difficulty in blending the beautiful with the useful in the construction of these buildings, if they do not, indeed, go so much hand in hand as almost to be inseparable. You perceive that the plan I allude to is constructed upon the principle of applying all the sound that can be caught by the reflecting surfaces of the building to those parts only of the theatre where the direct voice of the actor may prove too weak to be heard distinctly. There should be a note inserted to this effect in some part of the letter, viz., that as no similar sounds uttered in succession to each other can be heard separately by the finest ear when the interval of time between each does not exceed one-tenth of a second; therefore no reflected portion of a sound that arrives at the ear within less than one-tenth of a second after the direct pulse, will make a separate impression or echo, but will add to the strength of the former impression. Hence, as sound travels 1142 feet per second, unless the difference between the whole distance travelled over by the reflected pulse and that of the direct pulse be greater than 114 feet, no echo will be perceived. In the plan of the theatre sent the greatest difference of this sort only amounts to 68 feet; therefore, even in this instance, about one half of the influence of the reflected pulse would be exerted in adding to the intensity of the sensation of the direct pulse, and about one half in prolonging a nearly similar impression."

rial benefit to the observers, but it would have this objection, viz., that the seats, if so placed, must rise in steps, and have arms to each; hence the necessary allowance of room for the accommodation of the largest persons would be more than necessary for smaller ones, and on no occasion, however, pressing, could the advantage be taken of sitting closer. I have also drawn the scenery in a portion of a circle, which would be a most material advantage both to the hearing and sight, *if conveniently practicable;* and provided double the height of a scene can be had within the building, it might be managed by suspending the scenes on cords passing over rollers disposed in this form.

In constructing the elevation of a theatre, the first consideration is to economize space; hence in the boxes, as at No. 1, fig. 2, after allowing the seats to rise one foot in five for the purpose of clearing the view from the heads of those below, if a line be drawn to the top of the scenery from the eye of the most backward observer, the bottom of the next tier of boxes must just commence at that line, as exhibited by dots.

As it is advantageous in the metropolis to make theatres more extensive than the direct voice of an actor can fill with ease, it becomes necessary to call in the aid of reflected sound, and so to distribute the whole voice as may be deemed most important. I have in the inclosed sketch supposed that (in a theatre where the extreme part of the pit is 120 feet from the centre of the stage), the direct voice is sufficient till within one-fourth of the extremity of the building. Therefore the roof is so curved as to commence its reflection at that point, as may be traced by following the progress of the pulses of sound emitted by the actor at A. One half the roof, as far as C, is allowed to give the sound it receives over this portion of the pit and the three tiers of boxes. The remaining half

Fig. 2



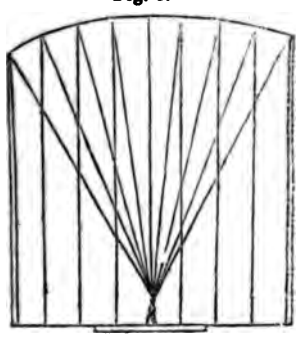
of the roof is employed in throwing its sound upon the upper gallery, increasing the density of its reflection as the distance from the stage increases. Although this gallery receives the influence of half the ceiling, yet from the oblique position of it, it will not catch more than half as much sound as the other portion, which is fully required by the distance of the hind part of the gallery, the direct sound being there 25 times less dense than in the quarter of the pit next the stage; whereas, by the reflection, this disproportion will be reduced to *about 10 times only*, and of course it will be as distinctly heard as in the third quarter of the pit.

The ratio of sound in the three front boxes compared with that of the first quarter of the pit, is as one-tenth to one; this by the reflection of half the roof will be reduced to about one-seventh; hence these parts will hear nearly as well as the centre of the pit. In addition to this, the back of each tier of boxes should be covered, so as to give a focus of sound, either to the front, middle, or last benches, as thought best; this is shown at 1, 2, 3. The two latter, where altered from the former, by dotted

coves. The fronts to the boxes should present reflecting curves, to throw their sound within the fourth region of the pit.

Fig. 3 is a hind view, showing the proper curve of the roof in this position, where the only object is to keep the diverging rays

Fig. 3.



of sound parallel after reflection, and clear of the sides of the boxes. I think it would not be particularly expensive to have the whole beam and pillar work of the theatre of cast iron; and likewise to make the elliptical part capable of being completely cut off from any fire in the other part of the building, by a jointed sheet-iron curtain to close up the stage every night after performance, or in case of fire during the play-hours. The name of this would be very attractive.

To prevent the bad effect of squeezing from sudden alarms, no door about a theatre should open inwards, and the outlets should be as large as possible, and some extra ones easily opened, if necessary: a good reservoir of water, and an engine or two on the spot are precautions too obvious to need an observation.

I have the honour to remain, Sir,

Your obedient servant,

GEORGE CAYLEY.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

As the twenty-sixth meeting of this Association, held at Cheltenham, is concluded, it falls to us to bring before our readers such of the papers submitted to it as claim their attention. These we shall, after this week, introduce into our pages as we find convenient, as independent articles, affixing to each, as a foot-note, the words "British Association, 1856."

We shall not occupy space by detailing the general arrangements of this year's meeting, as they embrace much which, while it is of the highest interest to those concerned in one or more of the various branches of science, is nevertheless remote from our objects.

Mr. Atherton's paper on "Mercantile Steam Transport Economy" is in our hands, but as we are anxious to give it entire, if possible, we defer its publication till next week.

The following paper was read by Mr. H. Bessemer, on Monday last:—

ON THE MANUFACTURE OF MALLEABLE IRON AND STEEL, WITHOUT FUEL.

The manufacture of iron in this country has attained such an important position that any improvement in this branch of our national industry cannot fail to be a source of general interest, and will, I trust, be a sufficient excuse for the present brief, and I fear, imperfect paper. I may mention that for the last two years my attention has been almost exclusively directed to the manufacture of malleable iron and steel, in which, however, I had made but little progress until within the last eight or nine months. The constant pulling down and rebuilding of furnaces, and the toil of daily experiments with large charges of iron, had already begun to exhaust my stock of patience; but the numerous observations I had made during this very unpromising period all tended to confirm an entirely new view of the subject, which at that time forced itself upon my attention—viz., that I could produce a much more intense heat without any furnace or fuel than could be obtained by either of the modifications I had used, and consequently that I should not only avoid the injurious action of mineral fuel on the iron under operation, but that I should at the same time avoid also the expense of the fuel. Some preliminary trials

were made on from 10lb. to 20lb. of iron, and, although the process was fraught with considerable difficulty, it exhibited such unmistakeable signs of success as to induce me at once to put up an apparatus capable of converting about 7 cwt. of crude pig iron into malleable iron in 30 minutes. With such masses of metal to operate on, the difficulties which beset the small laboratory experiments of 10lb. entirely disappeared. On this new field of inquiry I set out with the assumption that crude iron contains about 5 per cent. of carbon; that carbon cannot exist at a white heat in the presence of oxygen without uniting therewith and producing combustion; that such combustion would proceed with a rapidity dependent on the amount of surface of carbon exposed; and, lastly, that the temperature which the metal would acquire would be also dependent on the rapidity with which the oxygen and carbon were made to combine, and consequently that it was only necessary to bring the oxygen and carbon together in such a manner that a vast surface should be exposed to their mutual action, in order to produce a temperature hitherto unattainable in our largest furnaces. With a view of testing practically this theory, I constructed a cylindrical vessel of three feet in diameter and five feet in height, somewhat like an ordinary cupola furnace, the interior of which is lined with fire bricks, and at about 2 inches from the bottom of it I insert five tuyère pipes, the nozzles of which are formed of well-burned fire clay, the orifice of each tuyère being about three-eighths of an inch in diameter; they are so put into the brick-lining (from the outer side) as to admit of their removal and renewal in a few minutes when they are worn out. At one side of the vessel, about half way up from the bottom, there is a hole made for running in the crude metal, and on the opposite side there is a tap-hole stopped with loam, by means of which the iron is run out at the end of the process. In practice this converting vessel may be made of any convenient size, but I prefer that it should not *hold less than one*, or more than five tons, of fluid iron at each charge. The vessel should be placed so near to the discharge hole of the blast furnace as to allow the iron to flow along a gutter into it; a small blast cylinder will be required, capable of compressing air to about 8 lb. or 10 lb. to the square inch. A communication having been made between it and the tuyères before named, the converting vessel will be in a condition to commence work; it will, however, on the occasion of its first being used after relining with firebricks be necessary to make a fire in the interior with a few baskets of coke, so as to dry the brickwork and heat up the vessel for the first operation, after which the fire is to be all carefully raked out at the tapping hole, which is again to be made good with loam. The vessel will then be in readiness to commence work, and may be so continued without any use of fuel until the brick lining in the course of time becomes worn away, and a new lining is required. I have before mentioned that the tuyères are situated nearly close to the bottom of the vessel; the fluid metal will therefore rise some 18 inches or 2 feet above them. It is therefore necessary, in order to prevent the metal from entering the tuyère holes, to turn on the blast before allowing the fluid crude iron to run into the vessel from the blast furnace. This having been done, and the fluid iron run in, a rapid boiling up of the metal will be heard going on within the vessel, the metal being tossed violently about and dashed from side to side, shaking the vessel by the force with which it moves, from the throat of the converting vessel. Flame will then immediately issue, accompanied by a few bright sparks. This state of things will continue for about fifteen or twenty minutes, during which time the oxygen in the atmospheric air combines with the carbon contained in the iron, producing carbonic acid gas, and at the same time evolving a powerful heat. Now, as this heat is generated in the interior of, and is diffusive in innumerable fiery bubbles through, the whole fluid mass, the metal absorbs the greater part of it, and its temperature becomes immensely increased, and by the expiration of the fifteen or twenty minutes before named that part of the carbon which appears mechanically mixed and diffused through the crude iron has been entirely consumed. The temperature, however, is so high that the chemically combined carbon now begins to separate from the metal, as is at once indicated by an immense increase in the volume of flame rushing out of the throat of the vessel. The metal in the vessel now rises several inches above its natural level, and a light frothy

slag makes its appearance, and is thrown out in large foam-like masses. This violent eruption of cinder generally lasts about five or six minutes, when all further appearance of it ceases, a steady and powerful flame replacing the shower of sparks and cinder which always accompanies the boil. The rapid union of carbon and oxygen which thus takes place adds still further to the temperature of the metal, while the diminished quantity of carbon present allows a part of the oxygen to combine with the iron, which undergoes combustion and is converted into an oxide. At the excessive temperature that the metal has now acquired the oxide as soon as formed undergoes fusion, and forms a powerful solvent of those earthy bases that are associated with the iron. The violent ebullition which is going on mixes most intimately the scoria and metal, every part of which is thus brought in contact with the fluid oxide, which will thus wash and cleanse the metal most thoroughly from the silica and other earthy bases which are combined with the crude iron, while the sulphur and other volatile matters which cling so tenaciously to iron at ordinary temperatures are driven off, the sulphur combining with the oxygen and forming sulphurous acid gas. The loss in weight of crude iron during its conversion into an ingot of malleable iron was found on a mean of four experiments to be 12¼ per cent., to which will have to be added the loss of metal in the finishing rolls. This will make the entire loss probably not less than 18 per cent., instead of about 28 per cent., which is the loss on the present system. A large portion of this metal is, however, recoverable by treating with carbonaceous gases the rich oxides thrown out of the furnace during the boil. These slags are found to contain innumerable small grains of metallic iron, which are mechanically held in suspension in the slags, and may be easily recovered. I have before mentioned that after the boil has taken place a steady and powerful flame succeeds, which continues without any change for about ten minutes, when it rapidly falls off. As soon as this diminution of flame is apparent the workman will know that the process is completed, and that the crude iron has been converted into pure malleable iron, which he will form into ingots of any suitable size and shape by simply opening the tap-hole of the converting vessel and allowing the fluid malleable iron to flow into the iron ingot moulds placed there to receive it. The masses of iron thus formed will be perfectly free from any admixture of cinder, oxide, or other extraneous matters, and will be far more pure and in a forwarder state of manufacture than a pile formed of ordinary puddle bars. And thus it will be seen that by a single process, requiring no manipulation or particular skill, and with only one workman, from three to five tons of crude iron passes into the condition of several piles of malleable iron in from 30 to 35 minutes, with the expenditure of about one-third part the blast now used in a finery furnace with an equal charge of iron, and with the consumption of no other fuel than is contained in the crude iron. To those who are best acquainted with the nature of fluid iron, it may be a matter of surprise that a blast of cold air forced into melted crude iron is capable of raising its temperature to such a degree as to retain it in a perfect state of fluidity after it has lost all its carbon, and is in the condition of malleable iron, which in the highest heat of our forges only becomes softened into a pasty mass. But such is the excessive temperature that I am enabled to arrive at with a properly-shaped converting vessel and a judicious distribution of the blast, that I am enabled not only to retain the fluidity of the metal, but to create so much surplus heat as to re-melt the crop ends, ingot runners, and other scrap that is made throughout the process, and thus bring them without labour or fuel into ingots of a quality equal to the rest of the charge of new metal. For this purpose a small arched chamber is formed immediately over the throat of the converting vessel, somewhat like the tunnel head of the blast furnace. This chamber has two or more openings on the sides of it, and its floor is made to slope downwards to the throat. As soon as a charge of fluid malleable iron has been drawn off from the connecting vessel the workman will take the scrap intended to be worked into the next charge, and proceed to introduce the several pieces into the small chamber, piling them up around the opening of the throat. When this is done, he will run in his charge of crude metal, and again commence the process. By the time the boil commences the bar ends or other scrap will have acquired a white heat, and by the time it is over most of them will have been melted and run down into the charge. Any pieces, however, that remain, may then be pushed in by the workman, and by the time the process is completed they will all be melted, and ultimately combined with the rest of the charge, so that all scrap iron, whether cast or malleable, may thus be used up without any loss or expense. As an example of the power that iron has of generating heat in this process, I may mention a circumstance that occurred to me during my experiments:—I was trying how small a set of tuyères could be used; but the size chosen proved to be too small, and after blowing into the metal for one hour and three-quar-

[illegible], I could not get up heat enough with them to bring on the boil. The experiment was therefore discontinued, during which time two-thirds of the metal solidified, and the rest was run off. A larger set of tuyère pipes were then put in, and a fresh charge of fluid iron run into the vessel, which had the effect of entirely re-melting the former charge; and when the whole was tapped out it exhibited, as usual, that intense and dazzling brightness peculiar to the electric light.

To persons conversant with the manufacture of iron it will be at once apparent that the ingots of malleable metal which I have described will have no hard or steely parts, such as is found in puddled iron, requiring a great amount of rolling to blend them with the general mass, nor will such ingots require an excess of rolling to expel cinder from the interior of the mass, since none can exist in the ingot, which is pure and perfectly homogeneous throughout, and hence requires only as much rolling as is necessary for the development of fibre; it therefore follows that, instead of forming a merchant bar or rail by the union of a number of separate pieces welded together, it will be far more simple and less expensive to make several bars or rails from a single ingot; doubtless this would have been done long ago had not the whole process been limited by the size of the ball which the puddler could make.

The facility which the new process affords of making large masses will enable the manufacturer to produce bars that which, on the old mode of working, it was impossible to obtain; while, at the same time, it admits of the use of some powerful machinery, whereby a great deal of labour will be saved, and the process be greatly expedited. I merely mention this fact in passing, as it is not my intention at the present moment to enter upon any details of the improvements I have made in this department of the manufacture, because the patents which I have obtained for them are not yet specified. Before, however, dismissing this branch of the subject, I wish to call the attention of the meeting to some of the peculiarities which distinguish cast steel from all other forms of iron, viz., the perfect homogeneous character of the metal, the entire absence of sand-cracks or flaws, and its greater cohesive force and elasticity as compared with the blister-steel from which it is made, qualities which it derives solely from its fusion and formation into ingots, all of which properties malleable iron acquires in like manner by its fusion and formation into ingots in the new process. Nor must it be forgotten that no *amount of rolling will give* to blister-steel *(although formed of rolled bars)* the same homogeneous character that cast steel acquires by a mere extension of the ingot to some ten or twelve times its original length.

One of the most important facts connected with the new system of manufacturing malleable iron is that all the iron so produced will be of that quality known as charcoal iron; not that any charcoal is used in its manufacture, but because the whole of the processes following the smelting of it are conducted entirely without contact with or the use of any mineral fuel; the iron resulting therefrom will, in consequence, be perfectly free from those injurious properties which that description of fuel never fails to impart to iron that is brought under its influence. At the same time, this system of manufacturing malleable iron offers extraordinary facility for making large shafts, cranks, and other heavy masses; it will be obvious that any weight of metal that can be founded in ordinary cast-iron by the means at present at our disposal may also be founded in molten malleable iron, and be wrought into the forms and shapes required, provided that we increase the size and power of our machinery to the extent necessary to deal with such large masses of metal. A few minutes' reflection will show the great anomaly presented by the scale on which the consecutive processes of iron making are at present carried on. The little furnaces originally used for smelting ore have from time to time increased in size, until they have assumed colossal proportions, and are made to operate on 200 or 300 tons of materials at a time, giving out 10 tons of fluid metal at a single run. The manufacturer has thus gone on increasing the size of his smelting furnaces, and adapting to their use the blast apparatus of the requisite proportions, and has, by this means, lessened the cost of production in every way; his large furnaces require a great deal less labour to produce a given weight of iron than would have been required to produce it with a dozen furnaces, and in like manner he diminishes his cost of fuel blast and repairs, while he insures a uniformity in the result that never could have been arrived at by the use of a multiplicity of small furnaces. While the manufacturer has shown himself fully alive to these advantages, he has still been under the necessity of leaving the succeeding operations to be carried out on a scale wholly at variance with the principles he has found so advantageous in the smelting department.

Before concluding these remarks, I beg to call your attention to an important fact connected with the new process, which affords peculiar facilities for the manufacture of cast-steel.

At that stage of the process immediately following the boil the whole of the crude iron has passed into the condition of cast-steel of ordinary quality; by the continuation of the process the steel so produced gradually loses its small remaining portion of carbon, and passes successively from hard to soft steel, and from soft steel to steely iron, and eventually to very soft iron; hence at a certain period of the process any quality of metal may be obtained. There is one in particular, which by way of distinction I call semi-steel, being in hardness about midway between ordinary cast-steel and soft malleable iron. This metal possesses the advantage of much greater tensile strength than soft iron; it is also more elastic, and does not readily take a permanent set, while it is much harder, and is not worn or indented so easily as soft iron; at the same time it is not so brittle or hard to work as ordinary cast-steel. These qualities render it eminently well adapted to purposes where lightness and strength are specially required, or where there is much wear, as in the case of railway bars, which, from their softness and lamellar texture, soon become destroyed. The cost of semi-steel will be a fraction less than iron, because the loss of metal that takes place by oxidation in the converting vessel is about 2½ per cent. less than it is with iron; but, as it is a little more difficult to roll, its cost per ton may fairly be considered to be the same as iron; but, as its tensile strength is some 30 or 40 per cent. greater than bar iron, it follows that, for most purposes, a much less weight of metal may be used; so that, taken in that way, the semi-steel will form a much cheaper metal than any that we are at present acquainted with.

In conclusion, allow me to observe that the facts which I have had the honour of bringing before the meeting have not been elicited from mere laboratory experiments, but have been the result of working on a scale nearly twice as great as is pursued in our largest iron works, the experimental apparatus doing 7 cwt. in 30 minutes, while the ordinary puddling furnace makes only 4¼ cwt. in two hours, which is made into six separate balls, while the ingots or blooms are smooth, even prisms, 10 inches square by 30 inches in length, weighing about equal to ten ordinary puddle balls.

THE TRIAL OF REAPING-MACHINES AT BOXTED LODGE.

Reaping-machines cannot be fairly put to work during the July meeting of the English Agricultural Society, and an adjourned meeting for the determination of their merits is, accordingly, held a month later.

This year, on the invitation of Mr. Fisher Hobbs, the trial has come off at his farm, at Boxted-lodge. It took place on Wednesday last, under the superintendence and direction of Sir Archibald Macdonald, who acts as a steward of the implement department of the Society's annual show, and of the gentlemen who act as the Society's judges. Crosskill's modification of the original Scotch reaping-machine, by Bell; Burgess and Key's form of M'Cormick's American reaper; and Deane and Dray's machines, by Hussey, one having Palmer's side delivery, and the other the tipping platform, were working all the day. They were set to work on level land and over ridges, on standing corn and lying corn, on wheat and oats. The award of the judges is not known at the time we write this.

GREEN'S FUEL ECONOMIZER AND STEAM GENERATOR.

This simple and effectual apparatus for raising to a high temperature the feed water of boilers, by applying to it the waste heat of the flues, is now beginning to be very extensively adopted, not only in the north of England but in the south also, and in France. The idea on which its practicability is founded is a very obvious one, but the solution was not so easy, as, when pipes filled with cold water were introduced into the main flue of a boiler-house, soot rapidly deposited upon them, and, being a non-conductor, they soon failed to absorb the heat. To obviate this difficulty Mr. Green has attached to his apparatus a set of scrapers, which being worked from the engine or otherwise, as may be most convenient, keep the outer surface of the pipes clean. In this way, as appears by the concurrent testimony of many of our largest millowners and manufacturers, the temperature of the feed water is raised above the boiling point, and an economy of from one-fourth to one-third of the entire fuel previously consumed accomplished without any injurious effect upon the chimney draught. Mr. Green appears able to apply his invention to almost any plan of boiler house, and while the increased safety of having feed-water supplied at and above boiling point is obvious, the apparatus does not seem liable to wear out quickly, or to require frequent repairs. In the extensive establishments of the north, where the consumption of fuel for generating steam

power is so enormous, the importance of this fuel economizer begins to be widely recognized, but its adoption in the south and in France, where the cost of transit and other charges add so largely to the price of coal, will be attended with still more decided advantages.—*Times.*

MARINERS' TRAWL NET.

A very curiously constructed net, for capturing ground fish, has been recently invented by Mr. Henry Dempster, formerly a pilot at Bombay, East Indies. The apparatus is worked from a vessel that is sailing along about two knots per hour, something upon the principle of oyster dredging. The advantage of Mr. Dempster's improved trawling apparatus is, it never falls foul on the ground for fishing, at whatever depth the machinery may descend beneath the surface. Mariners who have plenty of rope on board, may bring themselves up ground fish, of some sort or other, from depths of 200 fathoms, with an apparatus of Dempster's construction. The invention has been tested practically, with success.

CLAY'S IMPROVEMENTS IN ROLLING TAPERED BAR IRON.

Mr. W. CLAY, of Liverpool, has recently patented an invention, which relates to forming tapering bar-iron of various sections, or bar-iron with indentations or projections. For forming a taper on the extremity of bars suitable for "points" the patentee sets the rolls to a distance apart that will correspond with the greatest depth which the formed bar is required to measure, and he provides a plate of iron or steel, of a taper form, and of a thickness corresponding exactly with the diminution of thickness required in the end of the bar under operation. This plate he takes in its cold state, and places over the end of the bar of red-hot metal, and then passes the two between the rolls. The taper plate, acting as a filling piece, or as an eccentric projection on one of the rolls would act, enables the rolls to put a severer pressure on the bar at the part overlaid by the plate, and thus by simple rolling in an ordinary rolling mill a tapered bar may be produced. The application of this principle of rolling may be further extended by giving to the contact face of the overlying plate such projections or indentations (whether gradual or sudden) as circumstances may require.

THE SMOKE QUESTION.

Prize Essay on the Prevention of the Smoke Nuisance. By CHARLES WYE WILLIAMS, Assoc. Inst. C.E. London: John Weale, 59, High Holborn. 1856.

(*Continued from p.* 130.)

THIS leads the author to an examination of the importance usually attributed to "a skilful or experienced stoker" under the impression that, by his good management, these discrepancies may be avoided. Several instances are here given of the erroneous estimates formed of "good stoking." The assumed value of *good stoking* is then treated with, perhaps, more attention than the subject really merits, but apparently in deference to the opinion generally entertained. The result of the inquiry is stated to be that with imperfect furnaces, as with other imperfect machines, more care and attention are required than should be called for, but that where furnaces are duly proportioned in all their parts, the duties of the stoker may be confined to the mere act of throwing in the fuel, the advantages of mechanical feeding being thus approximated to.

Diagrams are here given descriptive of the right and the wrong way of charging a furnace, with a short code of instructions, which have been found sufficient in steam vessels. The Essay then shows the importance of a *mechanical* rather than a *human* stoker, illustrated by reference to the plan of Brunton and the peculiar system adopted in the Cornish boilers, which correspond so nearly with each other.

We have here a clear distinction drawn between the Cornish *system*, and the Cornish *boiler*, showing that any boiler may act the part of the Cornish, provided the Cornish *system* be adopted, the leading peculiarity of which is *thin and frequent firing*, involving a uniform admission of air, and a uniform generation of gas.

Section 6 treats of effecting combustion by attention to the due admission of the air to furnaces, which is unquestionably the most important division of the subject, although the least examined, both by patentees and even by professional engineers. This branch of the subject necessarily involves a chemical analysis of the constituents of both the gas and the air, and although this may be distasteful to practical men, it is nevertheless the basis on which the combustion of fuel in furnaces must be based, and without due attention to which, all else must be either chance, or empiricism.

The chemistry of the combustion of coal is considered under the separate heads of what is due to the *gas* and what to the *coke* of the coal. The combustion of the gaseous

portion of coal involving all that belongs to visible smoke is here shown by a representation of the constituents of both the gas and the air—their relative equivalents as to weight and volume—and their respective unions. That this department is worthy the attention of even high chemical authority is shown by reference to the report made by Professor Faraday to the Athenæum Club, when consulted on the injury arising from the use of gas in their library. In his report (the substance of which is quoted,) he describes, in detail, the constituents of the gas and the air, and the products of their union during combustion, showing the vast preponderance of water, in the form of steam, among these products.

Reference is also made to the opinion of Professor Daniell, late of King's College, to the effect that, although only a given volume of air, say ten to one, is required for the combustion of the gas, yet to bring that quantity into action it will be necessary to supply double that proportion.

This forms an important feature of the subject under consideration, and the more so, as even the quantity absolutely required is much greater than appears to have been generally contemplated.

The following analysis of the coal gas is given, not merely to enable us to ascertain the quantity of combustibles for which the air is to be provided, but the necessity of providing that *each of the separate* combustible constituents shall have its due portion.

The products of each hundred pounds of coal, in round numbers, is stated to be as follows:

	lbs.
Hydrogen	5
Carbon in combination with the hydrogen and forming the gas	20
Carbon, in the form of coke ..	60
Nitrogen, sulphur, oxygen and ashes	15
	100

By this examination we are enabled to distinguish the three distinct combustible bodies into which coal is resolved in the furnace, namely, the hydrogen, the carbon of the gas, and the carbon of the coke, each of which requires its own special equivalent of air. The Essay then goes on to enforce the fact that, perfect or imperfect combustion, and the obtainment of the entire calorific effect of these several elements, will be determined, exclusively and absolutely, by the facilities offered to these three bodies in obtaining their respective quotas of the air supplied.

By this analysis it is shown that much more is necessary than the mere supplying of the required gross quantity of air, and that this circumstance renders it still more necessary to attend to the *mode* of introducing it. We strongly recommend this section to the deliberate attention of practical engineers and boiler makers.

Section 7 treats of the nature and properties of smoke. One might almost imagine that nothing new on this head could now be said, the volumes of this Magazine alone presenting the reader with all the details of the subject. The Essay now before us, however, really supplies new matter, inasmuch as by means of diagrams it places before the eye the several stages in which carbon, the black colouring element of smoke, exists, from the beginning to the end of the process of its combustion, or non-combustion.

One important effect of this analysis is that we are physically made acquainted with the reason why additional heat, (whether, as stated by Watt, through extraneous matter, or through the medium of hot air,) cannot be required, inasmuch as every atom of the carbon of the gas must of necessity be raised to the high temperature of 3,000°, at the moment when it ceases to be a constituent of the gas. We are here shown that, instead of supplying fresh *heat*, we have only to supply fresh *air* to effect combustion. Assuredly all must agree with the statement made in the Essay—that if the atoms of carbon are at 3.000°, nothing we can do can raise them higher, and that all that can be required is to supply the air before these incandescent luminous atoms are too much cooled down for chemical action.

In addition to the exhibition of the four stages through which the carbon of the gas passes in the process of its combustion, a diagram is also given, exhibiting in a visible form the comparative insignificance, as to *weight and volume*, which this carbon possesses when it forms a constituent of smoke. As to the *number* of atoms, the carbon is shown to be but one out of the twenty-one of which smoke must be formed; while as to *weight*, or commercial value, the carbon is represented by 6, while the incombustible constituents are represented by 292.

By this diagram and the chemical analysis which accompanies it, we learn that the weight of the carbon contained in the black cloud we call smoke, is in truth comparatively insignificant in commercial value as a combustible; and is, as described in the Essay, a mass composed of three gaseous bodies—"tinted, literally but tinted, by the atoms of carbon."

But even this analysis is not all: the Essay gives the relative quantities or volumes of each of these several constituents of smoke when forming the products of a ton weight of coal. 1st. Of the nitrogen. 2nd. The carbon. And, 3rdly. Of the steam, or vapour of water, the produce of the combustion of the hydrogen of the gas.

The large part which this latter element of the smoky cloud—the vapour—plays is here demonstrated by many illustrations. Among these is the fact that a single grain weight of carbon or soot, if duly mixed, is sufficient to give a gallon of water the colour of ink; hence the inference that the mere colouring matter of the smoky cloud is not to be relied on as proof of the quantity of combustible which it contains. The views here taken of the cause of the colour of the smoke places the subject in a new and important point of view, as illustrative of the great practical error involved in the ordinary phrase of "burning or consuming smoke," and which is so prevalent as to form the very basis of the present Act of Parliament, though inconsistent with chemical truth. This section contains, towards the end, the following remark:—"Those, therefore, who insist on asserting that smoke is a combustible, and may be burned, should be prepared to show how this cloud of watery vapour and gaseous matter can be separated from its minute complement of carbon; for, until that separation is effected, it is as absurd to speak of the combustion of the *cloud of smoke* as it would be of converting the air in the cloud of dust, which blows along our streets, to a profitable manure, for the mere sake of the solid matter which it holds in suspension." "Looking, then, at this cloudy mass, with reference to combustibility, we see that, since the separation of the carbon from its accompanying cloud is practically impossible, its combustion is equally so."

Section 8 treats of "the expense or economy in erecting or working the several plans." This head appears to have been introduced merely in compliance with the conditions imposed by the Society of Arts. In truth, as the essay states, nothing reliable in the way of such results can be obtained, even from the statements of the patentees themselves. As to expense, the essay observes, that as perfect combustion depends on the mode and extent to which the *combustible* and the *air* are brought together, there can be no justifiable room for any heavy cost. This fact, however, is stated to have raised great opposition, with predictions of all possible injury to boilers by the introduction of cold air, on the part of *those who had to obtain* a livelihood by their smoke-burning patents, and who could ill brook a more simple and therefore less costly apparatus.

Section 9 examines the practical application of the principles considered in the foregoing sections. Here we unquestionably arrive at what will be looked to as the most useful portion of the essay, and in this the author seems to have embodied the result of a long experience.

Having shown the futility of supposing that the question of good or bad boilers is to be decided by their mere dimensions, and before the principles by which dimensions would be ascertained are understood, the essay goes on to show that scientific examination must take the lead in determining the proper proportions of those vessels in which combustion is to be effected. The main subject of the essay being the formation of smoke, and this being caused exclusively by the presence of the gaseous element of the coal, the point for consideration is how this gaseous element is to be consumed. (*To be continued.*)

ON THE ORIGIN OF SOLAR, PLANETARY, AND STELLAR HEAT AND LIGHT.

To the Editor of the Mechanics' Magazine.

SIR,—In my last communication I advanced some speculations founded on the material theory of heat, the effects of condensation, and the force of gravitation, with a view to account for the intense heat which appears to exist in the interior of the globe. Towards the close of my communication, I hinted that it was possible to carry my theory through the whole planetary system, and far back into the past history of the universe. Speculations of this kind, when apparently based upon sound principles, are so attractive to my own mind, that I would fain hope they are not without their charms to others, and that some portion of your readers will not be unwilling to follow me a little further in my ramblings through the fields of physical philosophy and speculative inquiry.

Having in the former article considered the source of the central heat of our world, we will proceed, in the next place, to inquire—What is the source of the solar heat? We will take the principle that caloric is evolved by the condensation of ponderable matter. In the next place, I assume that ponderable matter is condensed, more or less, not only by direct compression, but also by the influence of gravitation. Matter transferred from the surface to the interior of the globe, comes under the more powerful influence of gravitation, and being thereby condensed, gives out what is commonly called

its "latent" caloric. But if we suppose a portion of matter taken from the surface of the globe, and transferred to the surface of the sun, we must admit that the transference is accompanied by a great increase of weight, or, in other words, the matter thus transferred is subjected to a greater intensity of the gravitating force. Thus, a portion of matter which exerts at the surface of the earth a degree of pressure which we call a pound, will, if transferred to the surface of the sun, there exert a degree of pressure upon that surface equal to what would be exercised upon our globe by a mass weighing (as we should say) very nearly twenty-three pounds. Thus water, at the surface of the sun, would be considerably heavier than mercury at the surface of the earth. The degree of heat given out by this increased weight or density, would be considerable. Could we, by any mechanical appliances, condense water so as for it to become as heavy as mercury, how enormous would be the evolution of caloric! But this condensation which takes place at the surface of the sun is very small, compared with that which takes place in the interior of that great luminary. If the power of gravitation is 120 times greater at the centre of our globe than at the surface, what must be the effect of a transference from the surface to the centre of the sun! And when we remember what an enormous mass of materials is collected in our central luminary, must we not be prepared to admit that an immense amount of caloric must be evolved from such a magazine of heat! And will not this amazing amount of heat account for the beams of light which issue from the sun? Of all the globes which constitute our solar system, the sun has the greatest store of materials, and therefore the greatest collection of caloric. And in the next place, not only has the sun the greatest collection of caloric, but also the most powerful apparatus (so to speak) for expelling that caloric, and rendering it available for the requirements of the whole planetary system.

If this theory be applied to the planetary bodies, the results are rather curious. The main exterior planets—Jupiter, Saturn, Uranus, and Neptune—are globes whose dimensions considerably exceed the magnitude of the earth. In consequence of this, the power of gravitation is greater at the surface of those planets than at the surface of the earth; and at their centres the increase of the gravitating force, compared to that of their surface, must be very considerable. In this way those planets may receive, from the compression of their materials, an increase of temperature which may, to some extent, compensate for their greater distance from the sun.

This argument stands closely connected with the nebular hypothesis. Although the supposed nebulæ have been resolved into stars, it by no means follows, I apprehend, that the so-called "nebular" hypothesis falls to the ground. For that theory is very partially dependent for its confirmation upon the present existence of nebulous masses. The nebular hypothesis, as I understand it, is essentially this—that the worlds were not created originally in the form of actual globes, but their elementary particles were first created in a diffused state, and afterwards gradually approximated to each other in accordance with what is called the law of gravitation, that approximation being accompanied by the development of orbicular, axial, and other motions. I will not pretend to say how far this theory is received or rejected by the scientific world; but to my own mind, it presents an appearance of simple grandeur and philosophic completeness which recommends it very much both to my taste and my judgment.

If the worlds have been aggregated in accordance with the views just hinted at, then we have the phenomenon of a continued condensation, and consequently the increasing evolution of heat, light, electricity, &c. If the worlds were originally created as we now find them, the idea of condensation could hardly be conceived; but if we admit the essential principles of the nebular theory, we have at once a long history of continued aggregation, and consequent compression, accompanied by the giving out of caloric and other imponderable forms of matter.

The existence of caloric I consider to be as real as the existence of iron; and I consider the creation of one to have taken place at the same time as that of the other. But the qualities of caloric are different from those of iron, and hence it has manifested itself in a different way.

Passing from the comparatively narrow bounds of our solar system to the region of the fixed stars, we are now perhaps somewhat prepared to account for their inherent and extraordinary lustre. These are orbs far exceeding in magnitude our gigantic sun itself; and in this case the force of gravitation must be proportionately greater, giving rise to a corresponding evolution of light and heat.

I am, Sir, yours, &c.,

JOSEPH PITTER.

254, High-street, Borough,
London, Aug. 11, 1856.

CAPTAIN NORTON'S SUBMARINE BEELZEBUB.

To the Editor of the Mechanics' Magazine.

SIR,—When I last fired my submarine beelzebub, reported in the *Mech. Mag.* of the 19th July last, it was by means of my waterproof igniting cork. I also fire my beelzebub after the following manner when used as a shipwreck signal, close to the shore: the raft which carries the signal shell has the paper shell placed in its centre, and being lowered into the water from the stern of the boat, I then insert my glass tube igniter by letting it, suspended by a piece of strong thread, lower itself by its own gravity into a tube which is united by a small piece of gutta percha to a stick feeler about 3 feet in length, and projecting from the bottom of the raft. When the raft drifts to the shore from the deep water where it is first lowered down, the feeler touches the bottom, and by the pressure of the raft moving onwards the glass tube igniter is fractured, and the consequent friction on its inner coating of Bell's lucifer composition fires the signal. — "*Utrum horum accipe.*"

I am, Sir, yours, &c.,
J. NORTON.

Rosherville, August, 1856.

EDUCATIONAL BOOKS FOR YOUTH.

To the Editor of the Mechanics' Magazine.

SIR,—Having addressed the enclosed correspondence to the Editor of the "Boys' Own Magazine," correcting an error in that Magazine, and he having taken no notice of it, I hope you will excuse my taking the liberty of placing it in your hands; and I shall feel greatly obliged by your taking some notice of it.

I am, Sir, yours, &c.,
AUGUSTUS WOODCOCK.

Lower Division Form, Merchant Tailors' School, August 12th, 1856.

SIR,—In your May number of the "Boys' Own Magazine," the answer given to No. 4 Philosophical Questions, viz., "Why does ice when heated become water?" you say, "Because heat expands the particles." This is not the case. Water (contrary to the general rule) does not, under all circumstances, expand by heat; for when below 42° Fahr. it expands by cold, and when at 32° Fahr. has increased one-ninth part in bulk; thus 4½ cubic inches of water would become 5 cubic inches when frozen, and consequently water would take up *less* room than ice, not *more*, as you state. The reason of this is that when frozen it is converted into solid crystals, which take up more *room than the particles of* water would do. At the end of the answer you say, "Now also you see why water pipes burst in a thaw." This is again an error; water pipes never burst in a thaw, but before the thaw takes place; because the water in the pipes freezes, and the ice taking up more room than water, they burst from this cause, although the mischief is usually not perceived until a thaw takes place.

I am, Sir, yours, &c.,
AUGUSTUS WOODCOCK.

May 12th, 1856.

SIR,—On the 12th of last month I wrote a letter to you, correcting the answer to No. 4, Philosophical Question, in the May number of the "Boys' Own Magazine." I now wish to inqu re whether you received that letter or not. If you did receive it you ought to have corrected your error for the benefit of your readers; if not, I will forward you a copy of it. You will oblige me by taking some notice of this in your next number.

I am, Sir, yours, &c.,
AUGUSTUS WOODCOCK.

June 13th, 1856.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

WARREN, T. *Improvements in the manufacture and moulding or shaping of glass.* Dated Dec. 15, 1855. (No. 2832.)

This invention consists in pouring the melted glass from ladles into suitable moulds, and so casting the required articles; and in the use of collapsible core-bars in the manufacture of pipes, cylinders, &c., of glass.

ASPINALL, J. *Improvements in machinery for curing sugar and extracting moisture therefrom, parts of which are applicable to separating liquids and moisture from substances containing the same.* Dated Dec. 15, 1855. (No. 2833.)

This invention consists in employing in the above-named machinery two hollow truncated cones placed one within the other, with a tapering space between them, and (in the case of curing sugar) in employing a certain liquoring pump.

HUTCHINSON, E. B. *An improved apparatus for forming and cutting elliptical figures.* Dated Dec. 15, 1855. (No. 2834.)

The patentee describes a machine composed of a horizontal beam with adjustable ends, certain pulleys, a vertical shaft, a sliding lever, a spiral spring, &c., by means of which elliptical figures may be described.

COATS, G. *Improvements in horse-shoes, and in attaching the same to horses' feet.* Dated Dec. 15, 1855. (No. 2836.)

Under these improvements, which are intended to avoid the slipping of horses in

frosty weather, provision is made whereby suitable holding pieces of hard steel may be attached to and detached from the shoes with great facility, without the removal of the shoe itself.

WALLACE, A., and J. WALLACE. *Improvements in bleaching, washing, or cleansing textile fabrics and materials.* Dated Dec. 15, 1855. (No. 2837.)

This invention relates to the use of heated air or gases for aiding the effect of the above processes. Under one modification the heated air is admitted to the ordinary "dash wheel," which is mounted upon a tubular shaft, which communicates with a hot-air pipe or duct by means of a stuffing-box.

CLAY, W. *Improvements in the manufacture of bar iron.* Dated Dec. 15, 1855. (No. 2839.)

A description of this invention is given on page 154 of this Number.

SALOMON, P. M., J. L. MONTGAZAN, and C. M. J. DE FLERS. *Improvements in the manufacture of gas from coals, and in the production of bituminous coke in that manufacture, and also in the apparatus connected therewith.* Dated Dec. 15, 1855. (No. 2842.)

These improvements consist in conducting the manufacture so that the bituminous matters distilled from the coal shall be deposited in coke while in a heated state, instead of passing away from the retort by the conduct pipes, and afterwards separated from the gas as usual.

COTTAM, S. F. *Certain improvements in mules for spinning cotton and other fibrous materials.* Dated Dec. 17, 1855. (No. 2843.)

These improvements consist in the application of an improved clutch-box to self-acting or hand mules for spinning, which improved clutch-box is to be substituted instead of the catch or clutch-boxes hitherto employed in such machines.

COLLIER, G., J. CROSSLEY, and J. W. CROSSLEY. *Improvements in apparatus employed in drying and stretching woven fabrics.* Dated Dec. 17, 1855. (No. 2844.)

In the drying of fabrics a series of cylinders are employed, heated by steam or otherwise, partly around which the fabric is caused to pass, such cylinders, as they successively act upon the fabric, having a slightly increasing surface speed, a stretching is also given to the fabric during the process. It is in imparting this increased speed that the invention consists.

BRACEGIRDLE, C. *Improvements in the manufacture of bolting cloths employed in dressing flour.* Dated Dec. 17, 1855. (No. 2845.)

This invention consists in manufacturing bolting cloths of hard spun and twisted silk wire.

STEWART, H. *A machine or apparatus for cleaning and polishing forks, spoons, and other like curved articles.* Dated Dec. 17, 1855. (No. 2846.)

This invention consists of convex and concave brushes or discs, or of brushes or discs so mounted as to be capable of being pressed by suitable springs into and upon convex and concave surfaces, and to which motion is communicated through a crank handle and toothed wheels, or otherwise. The brushes are filled with bristles, and the discs are covered with buff leather or other suitable polishing surface, and both brushes and discs are used, or either are used separately, as required.

JEFFREE, J. L. *Improvements in or additions to furnaces.* Dated Dec. 17, 1855. (No. 2847.)

This invention consists in placing in the smoke-box of furnaces with bridges, and in the fire-box at the back of tubular marine furnaces, hollow flattened pipes open at top or at the side, or both at top and at the side, and communicating with the atmosphere. "These pipes becoming hot, heat the smoke outside of them, and the air passing through them, and the heated smoke and air coming in contact, become converted into flame."

EVANS, O. C. *Improvements in digging machinery.* Dated Dec. 17, 1855. (No. 2848.)

This machine for spading or breaking up the earth consists of a truck or cart supporting a framework in which revolves a series of drums or broad faced wheels side by side, each carrying an endless belt or chain, and upon which a series of spades or spading forks is placed. As the machine is drawn over the ground, each spade is driven in so as simply to pierce the same without breaking in the first instance; the upheaval or turning of the earth is performed only at the time of leaving the ground.

GOLDING, G. G. *Improvements in boilers for heating, warming, or raising steam.* Dated Dec. 17, 1855. (No. 2850.)

The external form of the improved boiler is that of a screw, the thread of which projects considerably from the cylindrical portion. The outline of the thread may be either square, angular, or any other suitable form, and may be made with one, two, three, or more convolutions. The thread of the screw is hollow, to allow the water to circulate through the space formed by the top and bottom parts of the thread.

SANGSTER, W. *Improvements in the manufacture of stays and corsets.* Dated Dec. 17, 1855. (No. 2851.)

This invention consists in the application

of untraversed warp or loop made fabrics, and also of knit fabrics to the manufacture of stays and corsets. The fabrics may be made more elastic in some parts than in others, by the warp threads being caused at parts to lap under less and at parts under more needles.

HEMSLEY, W. *An improvement in the manufacture of elastic pile fabrics.* Dated Dec. 17, 1855. (No. 2853.)

This invention consists in cementing, by India-rubber cement, two loop made fabrics together, one made with pile, or on which pile has been produced by raising, and the other without pile.

JOHNSON, J. H. *Improvements in ships' tillers.* (A communication.) Dated Dec. 17, 1855. (No. 2855.)

This invention consists of a spirally-grooved barrel acting against a fixed cross-bar which forces the shaft carrying the barrel to slide longitudinally in its bearings, the end of the shaft sliding inside a tubular bar, and the barrel with its shaft shifting so as to pay off the rope or chain on one side and receive it on the other simultaneously at one point.

SMALL, A. *Improvements in marine compasses, and in apparatus applicable thereto.* Dated Dec. 17, 1855. (No. 2856.)

This invention relates to the application to mariners' compasses, or to dumb compasses, cards, or rings, of certain described contrivances designed for ascertaining the error or deviation of the compass needles, at all times when a celestial object is visible, and without requiring a sight of the horizon.

TOLHAUSEN, A. *An improved harvesting machine.* (A communication.) Dated Dec. 18, 1855. (No. 2859.)

The invention consists,—1. In a peculiar manner of driving or operating the sickle. 2. In the use of a pressure bar placed over the surface of the teeth of the sickle, whereby the pressure of the sickle teeth upon the fingers may be regulated as desired. 3. In a raking attachment applied to the machine.

HUMASTON, J. P. *Improvements in instruments for composing and transmitting telegraph messages.* Dated Dec. 18, 1855. (No. 2860.)

This invention relates to electric telegraphs of the recording kind, and consists, —1. In a machine which is termed a "telegraphic compositor;" and,—2. In a method of transmitting the composition over the wires. The principle adopted in the first part has already been proposed, and consists in punching holes in strips of paper in the order and shape necessary to form the required characters on the recording machine at the opposite end of the line of wires, and the patentee's first improvement is constructing a machine for rapidly composing any message to be transmitted on this plan. This machine consists of a set of punches so arranged that by indicating the letter or character to be make upon a finger key, a hole or set of holes, and spaces of the proper shape for that purpose, will at once be punched through the fillet of paper placed in a direction to receive it.

NICKELS, C. *Improvements in the manufacture of pile fabrics.* Dated December 18, 1855. (No. 2861.)

This invention relates to a former patent, dated 26th June, 1849. In place of a weft being introduced at each time of beating up, the shuttles employed are stopped during two beats up of the batten, in order that the cutters described may make their cut, and that the instruments which uphold the pile yarns may come out and again enter the warps with greater advantage than heretofore. And in place of the cutters making an inclined cut, they are caused to rise into a vertical position immediately before making the cut, and a weft-stopping apparatus is applied on each side of the loom.

PRICE, D. L. *Improvements in electric telegraphs, and in appliances connected therewith, as applied to railway trains and fixed stations.* Dated December 18, 1855. (No. 2862.)

These improvements, in the first place, have reference to the connections between the carriages in the electric circuit between distant points of a railway train. For this purpose the patentee employs a coiled spring, similar to a clock-spring, but which has a tendency to recoil and draw itself within a small circular case fixed to the carriage. Another part of the improvements consists in forming the immediate points of junctions of the connections between rail carriages, so as to have a double locking, or hold the one part with the other when united. The improvements in the telegraph instruments, and conducting parts connected therewith, are such that the patentee is enabled to work a bell and needle telegraph by means of one wire that, is to say, one out and one return current, for which purpose he arranges two precisely similar batteries at distant points, both to act as local, and which may both be put into action from either end of a railway train or station. To produce audible signals he employs the centrifugal bell hammer actuated by a train of wheels, but detached and set in motion by the electric current.

NEWTON, A. V. *An improved mode of manufacturing wrought-iron cannon.* (A communication.) Dated Dec. 18, 1855. (No. 2863.)

Claim.—The manufacture of wrought-iron cannon, by forming the faggot or pile of

lengitudinal bars, surrounded by a series of bands of iron, and the welding together of the whole mass by passing the same between rollers.

HYDE, H. *An improved mode of purifying alcohol or alcoholic spirits.* (A communication.) Dated Dec. 18, 1855. (No. 2864.)

Claim.—The use of the manganates and permanganates existing as soluble compounds, however obtained, for purifying alcohol, so as to adapt it to nice purposes.

DAVIES, E., J. M. SYERS, and C. HUMFREY. *Improvements in distilling resinous, bituminous, fatty and oily matters, and in the treatment of certain products therefrom.* Dated Dec. 18, 1855. (No. 2866.)

In distilling resinous, bituminous, oily, and fatty matters, it is desirable to obtain—1. A means of easily regulating the heat in the still; and, 2. The separation of the still and its inflammable contents from the furnace required to heat them. The patentees propose to attain these objects by the following contrivance:—They introduce into an ordinary still a coil of pipe. The furnace, placed at a lower level, and at some distance from the still, has also a coil of pipe in it. The two ends of the two coils are connected, and the tube is filled with fusible metal, which, being heated in the furnace, will circulate rapidly through the two coils of pipes, and transfer to the charge in the still any required degree of heat.

GLOVER, F. R. A. *An improved instrument or apparatus for taking angles and measuring lines, surfaces, and solids, and ascertaining the variation of the needle.* Dated Dec. 18, 1855. (No. 2867.)

This invention relates to improvements upon a former patent dated 2nd November, 1839, and consists in constructing the instrument with additional lines, divisions, scales, or graduations, in such manner that the required angles may be read by means of the reflector, &c.

GLOVER, F. R. A. *Improvements in the construction of breakwaters, sea-walls, and other structures or foundations of structures which lie partially or entirely under water.* Dated Dec. 18, 1855. (No. 2868.)

In order to construct the foundations of breakwaters, &c., where the natural bed of the sea or stream is composed of a shifting or moveable sand, the patentee fixes a number of pieces of framework by means of anchors, or by weighting them with ballast, and in order to insure a firm and sound structure, he bolts or connects the separate pieces together. The framework thus set up, serves gradually to collect the sands, &c., moved about by the waves, and to enclose and retain them, the deposit continually increasing until the framework is filled, and a compact mass has been produced on which any required superstructure may be erected. Secondly, he constructs the framework in the manner described, and gradually adds to the sand or materials collected a quantity of lime, cement, or concrete material during the process of collection, so as to expedite the solidification of the mass.

ROSS, G., and T. WILKES. *New or improved machinery for the manufacture of bolts, rivets, spikes, screw-blanks, screws, nuts for screws, and washers.* Dated Dec. 19, 1855. (No. 2870.)

This invention mainly consists in a method of forming spikes, rivets, bolts, and screw-blanks, by compressing the piece of heated iron in a pair of dies by the descent thereon of a plunger, the said dies opening and closing by sliding between two inclined sufaces.

RUSTON, R. *Improvements in the construction of anchors and appendages to be used therewith.* Dated Dec. 19, 1855. (No. 2871.)

This invention consists in giving elasticity to the shanks of anchors by a helical or coiled spring, inserted in a tubular shank; and in giving elasticity or a yielding power to cables by temporarily connecting springs thereto.

HADDEN, J., H., F. J., and C. S. *Improvements in circular frames for the manufacture of ribbed fabrics.* Dated Dec. 19, 1855. (No. 2872.)

This invention consists in holding or suspending the needles which are employed in circular frames (to produce the rib in ribbed fabrics) upon the free ends of levers, and in causing such needles to advance and recede by being pressed against a cam fixed upon a spindle around and outside of which they are placed. It also consists in the employment, on the free end of the levers aforesaid, of those needles for which M. Townsend and D. Moulden obtained a patent 13th Feb., 1819.

ABRAHAM, H. R. *Improvements in carriages and in certain appurtenances and appendages which belong to those used as hospital conveyances or ambulances.* Dated Dec. 19, 1855. (No. 2874.)

The patentee describes a vehicle which is said to combine a uniform balance with a full or partial load of passengers; also, the capability of dividing passengers from one another by the formation of separate compartments, with separate entrances.

HARVEY, G. *Improvements in portfolios.* Dated Dec. 19, 1855. (No. 2875.)

Each portfolio is made with two covers connected at the back; one has three flaps formed thereto, which, when the portfolio is closed, fold outside of the other cover. Each flap has attached to it a strap, and at the ends of the straps are fixed plates, each with a latch or socket to enter a lock or catch,

or loop, and to be fixed by bolts or catches in the lock.

WALKER, R. *Improvements in applying power to, and in machinery for raising and lowering coals and other articles from and into mines.* Dated Dec. 20, 1855. (No. 2876.)

This invention consists—1. In the direct application of a steam-engine to work the drum-shaft when the same is supported above the mouth of a pit or mine. 2. In the application of a wheel with cogs or teeth on its circumference taking into or between the links of a suitably constructed chain for raising and lowering coals and other articles from and into mines. 3. In attaching pieces to wire ropes used for mining purposes, which pieces take into recesses or enter between projections formed on a wheel to prevent slipping. 4. In working two mines or shafts of mines with the same chain or rope. 5. In the application of the improved chains or ropes for working mines furnished with steam engines placed in the ordinary position, and in conducting the chain or rope to the mouth of the pit by suitable pulleys, by which means the length of the chain or rope required is very little greater than the depth of the pit.

SHANKS, A. *Certain improvements in instruments for indicating pressures.* Dated Dec. 20, 1855. (No. 2878.)

This invention consists of the use of a conical capsule, having internal and external flanges, permitting the free movement of the plug or piston without leakage or sensible friction while moving upwards or downwards.

FLEMING, J., jun. *Improvements in bleaching, washing, cleansing, and preparing textile fabrics and materials.* Dated Dec. 20, 1855. (No. 2879.)

According to this invention, the rub boards, boilers, and dash wheels are arranged so as to insure a rapid transfer of the goods from one to the other, a series of rollers, reels, or guide eyes being fitted up for the purpose of effecting such transfer. The cloth is subjected to a ferment steep, and then wound upon rollers and placed at the side of the rub boards, which have two throws, each throw having two sets of toothed rubbers, and a set of grooved rollers, and small plain rollers being placed at each side, so that the cloth can be rubbed from either side of the rub boards. The rub boards are placed between four open boilers. Four dash wheels are connected to the boilers by pipes, for the passage of the hot water. The cloth is passed through cold water and soap into the rub boards, and thence to the boilers. After boiling, it is carried back through a box of boiling *water and soap, to the* rub boards, and this *process of rubbing and boiling* is repeated *until the cloth is sufficiently* softened and cleansed. After this it is passed on by means of the rollers into the dash wheels, and is treated with boiling soap or alkali, and afterwards washed with boiling water.

EVANS, E. *Improvements in combining and fixing railway bars.* Dated Dec. 20, 1855. (No. 2881.)

This invention consists in using two forms of railway bars. Trough or bridge rails are employed, together with other rails, each formed with a web or intermediate part between the head and foot or lower part of each rail. The hollow of the trough or bridge rails, and the webs and feet or lower parts of the other rails are made to fit each other, so that by removing the head or upper part of a rail it may enter the end of the next trough rail, and give support thereto, and these parts may be fixed together by bolts and nuts, or otherwise if desired. The trough rails are fixed as usual, and the other rails may be similarly fixed, or only short lengths of such other rails may be used between two trough rails.

ANTROBUS, P. *Improvements in preserving and packing flour.* Dated Dec. 20, 1855. (No. 2883.)

This invention consists in preserving and packing flour by forcing it by hydraulic or other great pressure into metal cases, and soldering or closing the same hermetically in such cases.

BARCROFT, J. *An improvement in the materials to be used in the manufacture of baskets and basket work.* Dated Dec. 20, 1855. (No. 2884.)

In this invention shavings of willow, or other wood or cane, are lapped or wound round a flexible core of cotton, flax, or other material, so as to cover the same, and the compound is then used in making baskets and basket-work.

BODMER, L. R. *Improvements in hydraulic seed-crushing machines or oil-presses.* Dated Dec. 20, 1855. (No. 2886.)

These improvements relate to certain contrivances for facilitating the extraction of the oil from seeds or other substances by pressure, and also for facilitating the flow of the oil from the receptacles containing the substances. The receptacles preferred are plain wrought iron rings. Each ring stands upon a perforated plate or strong wire sieve, resting upon the grating or grooved surface of the tray or platform. A plunger provided with a similar grating and perforated plate is placed over the ring, and will, when the press is in operation, enter into it, whereby the oil contained in the seed will be squeezed out, and escape through the two perforated plates (the area of each of which is equal to that of the ring) into the grates of the trays and plungers, which communicate, by means of suitable passages, with spouts from which the oil

is discharged into receivers. The whole press is suspended in bearings by trunnions. This arrangement admits of the press being brought into a slanting or horizontal position, whereby the gratings assume a position favourable for the off-flow of the oil.

KYLE, D. D. *A method of communicating motion.* Dated Dec. 21, 1855. (No. 2887.)

Claims.—1. The application of the weight or a portion thereof in driving or propelling locomotive engines, especially when off rails. 2. A certain arrangement described for lifting the weight, by means of wheels travelling on the peripheries or other concentric parts of the leading wheels.

SAFFROY, J. B. E. *An improved break for railway-carriages.* (A communication.) Dated Dec. 21, 1855. (No. 2888.)

These improvements relate to the adaptation of parts in connection with clutch boxes, to operate as a break upon the axles of the wheels. The clutch boxes are arranged in pairs, one on each side of two supporting axles of the carriage, and one part of each clutch box is fixed to the axle, whilst the other is capable of sliding thereon, and has formed upon or fixed to it two pulleys or wheels, one larger than the other. These pulleys or wheels of the sliding part of the clutch box to one axle are connected to the like parts of the clutch box of the other axle by chains, one end of each of which is connected to the larger pulley or wheel of the loose part of one clutch box, and the other end to the smaller pulley or wheel of the other clutch box. The sliding of the parts of the clutch boxes into and out of gear with each other is effected by suitable gear. When it is desired to stop the carriage, the parts of the clutch boxes are brought together, the action of the double chains effecting the stoppage.

WATSON, J. *Improvements in the manufacture or production of articles of ladies' dress.* Dated Dec. 21, 1855. (No. 2889.)

This invention relates to the manufacture or production of woven fabrics for the skirts, &c., in the tubular or bag form. This species of fabric is woven in a common hand or power loom, the heddles in number and arrangement being suitably contrived and worked, after the general manner hitherto pursued in the manufacture of solid tubular sacks, hose pipes, &c.

HUGHES, B. *A mode of mingling the vapour of bi-sulphuret of carbon and steam, and applying them as a motive power.* Dated Dec. 21, 1855. (No. 2891.)

This invention consists in mingling the vapour of bi-sulphuret of carbon and steam, and applying them as a motive power, and in constructing a generator in connection with a steam boiler, alone or in combination with an apparatus for gradually heating the bi-sulphuret of carbon as it reaches the generator, and in an apparatus for separating from the condensed steam the condensed bi-sulphuret for re-use.

TOMLINSON, M. *An improved medical plaister.* Dated Dec. 21, 1855. (No. 2892.)

This invention consists of a combination of cod-liver oil with litharge, so as to produce a pigment or plaister called "cod-liver oil plaister." The said combination is effected by boiling the two together.

APPLETON, C. J. *Improvements in machinery or apparatus for knitting.* (A communication.) Dated Dec. 21, 1855. (No. 2893.)

This invention consists in employing a peculiar kind of needles working in grooves, which form the loop by a rising and falling motion, given to the needles by a circular cam or cams formed by placing one or more inclines on the interior or exterior of a cylinder. Each cam has a corresponding carrier and presser.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

TWIST, S. *Improvements in castors for furniture and other purposes.* Dated Dec. 15, 1855. (No. 2838.)

These improvements consist in making adjustable castors to suit inequalities in floors, by fitting on the top of a piece of furniture a cap, round which is turned a screw. The socket of the castor is also tapped in the inside with a female screw, and the foot of the piece of furniture screws into it. By turning the socket, you can raise or lower the leg.

STEWART, S. *An improved combined engine and gas exhauster, and also improvements in the valves of such exhausters.* Dated Dec. 15, 1855. (No. 2840.)

The main feature of this invention consists in placing the piston of the gas exhauster, which is a cylinder or double acting pump, in direct communication with the piston of a steam or other reciprocating engine; that is to say, the pistons of the parts are connected to the same rigid rod, or are otherwise rigidly connected, and reciprocate uniformly and simultaneously with each other.

CLAY, W. *Improvements in the manufacture of iron and steel.* Dated Dec. 15, 1855. (No. 2841.)

This invention consists in taking crude or cast iron in a melted state, and reducing it to a granular form, for conversion by the subsequent ordinary processes.

EAST, F. W. *Improvements in waterproofing and enamelling* textile and other *fabrics, in imitation of* and to be used in lieu

of leather, and for other similar purposes. Dated Dec. 17, 1855. (No. 2849.)

The fabric to be coated is wound upon a roller, and this is placed in a described machine constructed for the purpose of spreading or distributing an even coat of the enamelling material over the surface. The construction of the drying chamber forms the second part of the invention. It is fitted with frames, one above another; to these frames lengths of cloth are fastened, forming a series of shelves upon which the coated fabrics rest. The shifting platforms enable the operators to place a length of prepared fabric upon each shelf in succession until the series are filled. The drying chamber is heated by a furnace beneath, or by steam pipes, or other convenient means. The process of varnishing the prepared cloths is effected by a roller fitted with brushes, and fitted at the back of the knife of the coating or distributing machine. To give a grained or embossed surface to the prepared fabrics, forms the third part of the invention. The inventor uses an electrotype plate taken from the surface he wishes to imitate, and forces the coated fabric into the interstices of the plate by means of pressure, so as to obtain an exact copy of the plate.

LEITCH, J. *Improvements in filtering sugars and other saccharine matters.* Dated Dec. 17, 1855. (No. 2852.)

This invention consists in the use of a series of filter bags, one over the other. The bag first receiving the sugar is made of a comparatively open material, and those under it of materials gradually increasing in fineness. The whole are suspended within a vessel in which an equal temperature is maintained.

FONTAINE, J. J. *Improvements in the manufacture of steel.* Dated Dec. 17, 1855. (No. 2854.)

The cast iron is melted, and a current of heated air is passed over its surface. A mixture of cast iron, peroxide of manganese, and chloride of potassium, magnesium, calcium, strontium, or barium; or hypochloride of potass, soda, lime, magnesia, strontia, or baryta is then added and mixed in. The complete conversion of the cast iron thus purified into steel is effected in the ordinary manner.

WILKINSON, W. *Improvements in machinery employed in the manufacture of looped fabrics.* Dated Dec. 17, 1855. (No. 2857.)

This invention refers chiefly to improvements upon machinery patented by the inventor, Dec. 17, 1852, and consists—1. In an improved form of sinker, produced by cutting off the nib from a certain sinker. 2. In making a nick in the upper part of each *guide, which opens* into a slot which leads into the eye of the guide, and so enables a number of them to be threaded with great ease. 3. In certain new arrangements of machinery, and a new cut of wheels, whereby with one and the same thread he covers both sides of a cotton or other suitable core, producing a piled surface on one side and an even surface on the other.

WESSEL, C. R., and G. BOWDEN. *Joining elastic webbing into indissoluble bands.* Dated Dec. 18, 1855. (No. 2858.)

1. Elastic webbing is cut into required lengths and breadths; such webbing may be of cotton, silk, or other fibrous material. 2. The ends of such cut webbing are joined by means of oi'let holes, and thereby form a superior and indissoluble band. 3. The oi'let holes serve as a medium for passing a cord or other fastening, and is a simple means of attaching this band to paper parcels, &c.

NEWTON, A. V. *Improvements in washing machines.* (A communication.) Dated Dec. 18, 1855. (No. 2865.)

Set up in a circular tub or vessel is a central shaft, which carries a disc, formed with a conical under surface, upon which conical half round ribs are fixed, and arranged radially around the central shaft. The bottom of the tub is also similarly provided, and by the application of these conical ribs the tendency of the cloths under operation to work (by reason of centrifugal force) too readily towards the sides of the tub will be checked. Attached to the upper side of the disc is a batten for giving it strength, and from the batten project two posts which carry a horizontal cross bar or handle, for giving rotary motion to the disc which rubs and turns over the cloths that are placed beneath it.

CARTWRIGHT, J. *Improvements in taps or valves.* Dated Dec. 19, 1855. (No. 2869.)

1. The inventor makes the seating of the valve and the valve itself of a plain surface. 2. He makes two or more apertures through the said valve and seating, to allow the fluid to pass through. 3. He forms a seating by the nut itself, to prevent the necessity of packing, which he accomplishes by forming on the valve spindle a second shoulder, so that when the nut is screwed up to it, a second seating is formed, and the necessity of packing thus prevented.

SANDERS, J. *Improvements in trusses for supporting parts of the human body.* Dated Dec. 19, 1855. (No. 2873.)

These improvements relate to the springs of trusses, and consist in making them in the form of a double spiral, the smaller diameter being at about midway of the entire length of the spring, similar to the springs employed in the seats of furniture.

SIEVIER, R. W. *Improvements in guns*

and pieces of ordnance, and the projectiles thrown from them for the purposes of war. Dated Dec. 20, 1855. (No. 2877.)

This invention consists—1. In casting ordnance with hollow spaces or interstices all over the outer surface of the same. 2. In forming cannon in three pieces. 3. In forming cannon of pieces of wrought-iron or other metal welded or rivetted together. 4. In forming a cannon capable of being loaded at the breech. 5. In forming a cannon or piece of ordnance, having a rod fixed along the centre of the barrel, for firing a shot, having a hole through it which fits the rod.

BOUSFIELD, G. T. *Improvements in machinery for splitting leather.* (A communication.) Dated Dec. 20, 1855. (No. 2882.)

The improved machine is of that class in which the leather is fed upon an elastic feed apron, and is forced against the edge of a knife by feed rolls. The apron preferred is that for which a patent was granted to the patentee on the 20th of Dec., 1854. The machine is so constructed that it is enabled to draw and propel at the same time, or to do either one without the other, according to the nature of the leather to be operated upon.

PROVISIONAL PROTECTIONS.

Dated July 16, 1856.

1669. John Bourne, of Billiter-street, London, Middlesex, civil engineer. An improved construction of paddle-wheels, usually termed feathering paddle wheels. A communication.

Dated July 17, 1856.

1683. John Cartwright, of Shrewsbury, Salop, agricultural implement manufacturer. Improvements in agricultural implements, called chain harrows, for more effectually dressing and cleaning land.

Dated July 21, 1856.

1715. Elias Leak, of Longton, Stafford, lathe-maker. A thimble pillar, with points and branches, to be used in placing "glost" china and earthenware in ovens and kilns, when firing, burning, or baking such ware, in lieu of the cockspurs and stilts now in use for that purpose.

1717. Francis Barbour, Manchester, Lancaster, linen manufacturer. Improvements in penholders. A communication from E. W. Hanson and E. G. Kromer, Philadelphia, U.S.

1719. James Clark, of Newton-heath, Manchester, India-rubber manufacturer. Improvements in the manufacture of waterproof fabrics.

1721. John Gedge, of Wellington-street South, Strand, Middlesex. Improvements in obtaining and applying motive power. A communication from V. Cantillon, of Belgium.

1723. Maurice Vergnes, of New York, U. S. Improvements in electro-galvanic machines for producing motion by galvanic electricity.

1725. John Edward Hodges, of Leicester, manufacturer. Improvements in machinery for the manufacture of looped fabrics.

1727. Jacob Bing, of Hamburgh, merchant. A new sauce boat or vessel for containing liquids of different densities.

Dated July 22, 1856.

1729. Clothilde Amet, of Tavistock-street, Middlesex. Improved means of distending articles of dress and preserving the form or shape thereof. A communication from R. C. Milliet, of Besançon, France.

1731. Elias Weisskopf, of Pesth, Hungary, merchant. An artificial combustible, chiefly applicable to the kindling of fires.

1733. Sven Johan Agrell Burg, of Serle-street, Lincoln's-inn, Middlesex. Certain improved apparatus for preventing the explosion of steam boilers. A communication from W. Palmer, of New York, U. S.

1735. Samuel Butcher, of Bristol, ironmonger. Improvements in kitchen ranges.

1737. James Clark, of Newton-heath, Manchester, India rubber manufacturer. Improvements in the manufacture of beds, mattresses, cushions, and seats.

Dated July 23, 1856.

1739. George North, of Ashburnham-road, Greenwich, Kent, coach builder. An improved spring catch for the security of jewellery and articles of personal ornament and general utility.

1741. Ferdinand Potts, tube manufacturer, of Birmingham, Warwick. Certain improvements in tags for stay and other laces, as also in the machinery for forming and finishing the same.

1743. William Webster, of Bunhill-row, Middlesex. An improved steam and fire-regulator. A communication from J. Woodruff, of New Jersey, U.S.

1744. William Webster, of Bunhill-row, Middlesex. Improvements in pumps. A communication from A. Tower, of New York.

1745. Roger Bolam Ellison, of Brook-street, London-road, Carlisle, Cumberland, locomotive engine driver. Improvements in electric telegraph apparatus.

1747. Alexander Bain, of Brompton, Middlesex, and Bennett Johns Heywood, of Leicester-square, in the same county, gentleman. Improved apparatus for supplying and drawing off liquids and for stopping the flow of liquids and aëriform bodies.

1749. John Derbyshire, of Longton Potteries, Stafford. Improvements in cocks, taps, and valves.

1751. Constantin Louis Detouche and Jean Jacques Emile Robert Houdin, jun., of Paris, France. Improvements in the application of clocks or timekeepers, actuated by electricity, to street and other lamps.

Dated July 24, 1856.

1753. Helmuth Carl Friedrich Martin Petschler, of Manchester, Lancaster, clerk. Improvements in obtaining and applying motive power, and in the machinery or apparatus connected therewith.

1754. James Ashman, of Swansea, Glamorganshire. Improvements in the manufacture of artificial limbs.

1755. Charles Burton, of Regent-street. Improvements in warming houses and other buildings.

1756. George Tomlinson Bousfield, of Sussex-place, Loughborough-road, Brixton, Surrey. An improvement in the manufacture of driving straps or bands. A communication.

1757. George Tomlinson Bousfield, of Sussex-place, Loughborough-road, Brixton, Surrey. Improvements in the manufacture of flexible hose and tubes. A communication.

1758. George Collier and John Crossley, both of Halifax, York, and James William Crossley, of Brighouse, Halifax. Improvements in finishing and stretching woven fabrics.

1759. George Alexander Copeland, of Constantine, near Falmouth, Cornwall. An improved safety blasting cartridge, for the use of miners and quarrymen.

1760. Charles Tiot Judkins, of Fleet-street, London, Middlesex. An improved gas regulator.

1761. Joshua Mather and William Forshaw, of Bolton-le-Moors, Lancaster, mechanics. Certain improvements in pickers for looms and apparatus connected therewith.

1762. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in grindstones. A communication from B. Picard, of Fontenay le Chateau.

1763. Charles François Cattaert, merchant, of Paris, French Empire. Improvements in the stoppering of inkstands, bottles, pots, jars, and other vessels, and closing cocks.

Dated July 25, 1856.

1764. George Tomlinson Bousfield, of Sussex-place, Loughborough-road, Brixton, Surrey. Improvements in the manufacture of vulcanized India-rubber thread. A communication.

1766. Edward Lord, Thomas Lord, Abraham Lord, and William Lord, all of Todmorden, York, machine makers. Improvements in machinery for opening, blowing, scutching and preparing cotton and other fibrous substances.

1767. William Wood, of Monkhill House, near Pontefract, York, gentleman. Improvements in machinery or apparatus for weaving pile fabrics.

1768. Thomas Byford, of Carlton-villas, Edgeware-road. Improvements in horses' bits.

1769. Robert Stewart, of Glasgow, N.B., miner. Improvements in cutting stone and other mineral substances.

1770. Thomas Wrigley, of Bury, Lancaster, paper manufacturer. Certain improvements in machinery or apparatus for cleaning "cotton waste" or other materials used in the manufacture of paper.

1771. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in scutching machines. A communication from C. Leyherr, of Laval, France, spinner.

1772. Samuel Jay and George Smith, both of Regent-street, Middlesex. Improvements in stuffing or padding couches, cushions, bedding, chairs, and other similar articles.

1773. Ebenezer Howes, of Liverpool, Lancaster, gentleman. An improved construction of anchor. A communication from Captain S. Clarke, of New York, U.S.

1774. William Lanphier Anderson, of Norwood, Surrey, gentleman. Improvements in propellers.

1775. Isham Baggs, of Manchester-street, Argyle-square, Middlesex, engineer. Improvements in apparatus for lighting, signalling, and telegraphing by means of electricity.

1776. Julien Denis, of Queenhithe, London. Improvements in cutting or perforating steel and other metals. A communication.

Dated July 26, 1856.

1777. Joseph Platt, of Audlem, Chester, gentleman. Improvements in door knockers.

1778. Charles Hodges, of Manchester, Lancaster, manufacturer and merchant. Improvements in apparatus for unwinding silk, thread, or yarn from the hank. A communication.

1779. Richard Clarke Pauling, of Great George-street, Westminster, civil engineer. Improvements in giving increased buoyancy to ships and vessels, in raising sunken vessels, in keeping structures water-tight, and in propelling vessels.

1780. James Dickinson, of Liverpool, Lancaster, ship and anchor smith. Improvements in anchors, and in the manufacture of the same.

1781. Samuel Yeaden, of Idle, near Bradford, York, reed maker, and George Chapman, of Stockport, Chester, draper. Improvements in the construction of reeds for weaving, and in machinery or implements and materials to be used in such construction.

1782. George Colleton Cooke, of George yard, Lombard-street, London, gentleman. Improvements in stereoscopes.

1783. Henry Remington, of Camberwell, Surrey, gentleman. An improved gas heating and cooking apparatus.

Dated July 28, 1856.

1787. Edmund Eaborn and Matthew Robinson, engineers, Clement-street, Birmingham, Warwick. Certain improvements in machinery to be used for confectionary purposes.

1789. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Certain improvements in steam engine governors. A communication.

Dated July 29, 1856.

1791. William Griffin, of Northampton, and Elizabeth Duley, of the same place. Improvements in studs and buttons for fastening articles of dress.

1793. John Knowles, of Calow, Derby, ironmaster, and William Buxton, of Brimington, Derby, manager. Improvements in tuyères.

1795. Henry Richard Bowers, of Penbedw, near Ruabon, Denbigh, manufacturer. Improvements in machinery or apparatus for grinding, crushing, or pulverizing clay and other substances.

1797. Alexander Williams Anderson, of Trinidad, inspector of schools. Improvements in refining sugar.

Dated July 30, 1856.

1799. Robert William Sievier, "sculptor," of Upper Holloway, Middlesex. Improvements in preserving wood from decay and also from destruction by insects.

1801. Julien Denis, of Queenhithe, London. An improved gelatinous and economical soap. A communication.

1803. Francis Constable Simons, of Kensington, Middlesex, lieutenant in the Bengal artillery. An improvement in rifling the barrels of fire-arms and ordnance.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

1826. William Franklin Shaw, of Massachusetts, U.S. An improved burner or apparatus for the combustion of air and inflammable gas. Dated 1st August, 1856.

EXTENSION OF PATENT.

13. John Lee, of Brunswick-street, Trinity-square, Southwark, Surrey, civil engineer, "Certain improvements in wheels and axle trees to be used in railways, and in machinery for stopping on or preventing such carriages from running off railways, which improvements might also be applied to other carriages and machinery," for the term of five years from and after the expiration of the term of fourteen years, granted by the original Letters Patent, dated 3rd Aug., 1842. Sealed 8th Aug., 1856.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," August* 12*th*, 1856.)

744. A. Daniel. Improvements in the manufacture of keys and locks.

780. J. Bentley. Improvements in breech-loading fire-arms, and in the cartridges to be used therewith.

789. J. Paterson. Improvements in the manufacture of paper.

792. R. Roberts. Improvements in omnibuses and other passenger carriages.

793. P. McGregor and T. Marquis. Certain im-

provements in the machines for spinning called throstles.

806. W. Billinton. Improvements in strengthening and preserving wood and timber.

808. T. White. Improvements in slips and ways for receiving ships or vessels requiring repair, and for apparatus to be used for hauling up ships or vessels.

813. C. W. Ramié. Improvements in constructing the permanent ways of railways.

820. J. G. Martien. Improvements in the manufacture of iron.

823. O. Blake. Improvements in the manufacture of glass.

827. J. Bernard. Improvements in machinery or apparatus employed for manufacturing or making boots and shoes, or other coverings for the feet.

831. W. P. Maddison. An improved telegraph or apparatus for the transmission of signals.

834. H. Craigie. Improvements in heating apartments where gas and water are used.

844. W. C. Fuller. Improvements in constructing and adapting India-rubber as tyres for wheels.

846. W. H. Gauntlett. Improvements in thermometric apparatus.

855. J. Gedge. Improvements in the treatment or preparation of leather, and in the manufacture of articles composed thereof.

864. W. Hall. A method of stopping or retarding the way of ships and vessels in order to prevent collisions and otherwise.

874. J. Mash. Improvements in the fusible plugs and furnaces of steam boilers.

878. F. Nuibo-y Pedros. A new motive power.

886. L. P. Coulon. A new type-distributing and composing machine.

892. L. Kaberry and A. Horsefield. Improvements in moulding for casting certain parts of machinery used in the preparation and spinning of cotton and other fibrous materials.

924. J. Marsh. Improvements in fire-grates.

942. W. J. J. Varillat. Improvements in the apparatus for the extraction of colouring tanning and saccharine matters from vegetable substances.

952. J. A. M. F. Chambor. Improvements in fire-places.

1035. A. J. Paterson. An improvement in or connected with hawsers and other ropes or chains used in towing vessels.

1037. A. Smith. Treating vegetable fibres in order to fit them for use as a substitute for bristles in paint and other brushes.

1103. R. A. Brooman. Improvements in machinery for the manufacture or finishing of tyres, hoops, and rings.

1317. J. Bauzemont. Improvements in purifying turpentine.

1380. A. E. Preux. Warming railway and other vehicles.

1394. J. Fairclough. An improved expander and contractor for dining tables.

1444. G. L. Molesworth. An improved pendent child's cot.

1446. G. Pye. An improvement in preparing silk.

1501. G. Dürrich. Improvements in gas-burners.

1509. J. J. Foot. Improvements in weaving narrow fabrics.

1601. W. Youtman. Improvements in valves and plugs.

1615. D. Fisher. A composition for coating metal plates or wheels used for grinding, sharpening, or polishing.

1653. P. B. Rassant. A new mechanical contrivance for transforming an alternate into a continuous circular motion.

1656. A. V. Newton. An improved mode of securing the plastering of ceilings and walls.

1667. G. T. Bousfield. Improvements in pumps.

1672. A. V. Newton. Improved apparatus for obtaining rotary motion.

1683. J. Cartwright. Improvements in agricultural implements, called chain harrows, for more effectually dressing and cleaning land.

1686 A. V. Newton. An improved regulator for heating apparatus.

1693. J. Cowley. Improvements in the manufacture of paper from straw and other vegetable substances.

1707. W. A. Jump. Improvements in the manufacture of salt.

1725. J. E. Hodges. Improvements in machinery for the manufacture of looped fabrics.

1733. S. J. A. Burg. Certain improved apparatus for preventing the explosion of steam boilers.

1742. J. Onions. Improvements in the manufacture of iron.

1756. G. T. Bousfield. An improvement in the manufacture of driving-straps or bands.

1757. G. T. Bousfield. Improvements in the manufacture of flexible hose and tubes.

1764. G. T. Bousfield. Improvements in the manufacture of vulcanized 'ndia-rubber thread.

1767. W. Wood. Improvements in machinery or apparatus for weaving pile fabrics.

1779. R. C. Pauling. Improvements in giving increased buoyancy to ships and vessels, in raising sunken vessels, in keeping structures air-tight, and in propelling vessels.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1853.

1838. John Hughes.
1839. John Marten.
1855. William Baines.
1862. Thomas Mac Sweny.
1863. Samuel Hall.
1870. Richard Farmer Brand.
1874. George Deards.
1876. William Longmaid.
1889. Thomas Allan.
1911. Richard Archibald Brooman.

LIST OF SEALED PATENTS.

Sealed August 8, 1856.

1856.

343. John Elce and Samuel Fletcher Cottam.
356. Henry Bessemer.
361. Frederick Steiner.
365. William Frederick Collard Moutrie.
366. Samuel Fox.
367. Richard Knight.
372. Henry Fort Mitchell, William Mitchell, and John Clarkson.
383. John Taylor.
389. George Gulliver and John Goldthorpe.
439. William Oliver Johnston and John Dixon.
457. Leonard Bower.
472. Samuel Rodgers Samuels.
485. John Barrow.
515. Pierre Louis Grosrenaud.
530. John Henry Johnson.
541. Julius Homan.

679. John Henry Johnson.
700. William Edward Newton.
1097. George Jordan Firmin.
1099. William Edward Wiley.
1113. Bartholomew Beniowski.
1116. Richard Whytock.
1122. Michael Hodge Simpson.
1124. Hiram Tucker.
1129. William Edward Newton.
1224. Charles Barreswil.
1243. Pierse Eustace Laurence Barron.
1254. William Hulse.
1257. Frederick Charles Jeune.
1279. Alexander Drew and Matthew Gray.
1339. John Norris.
1390. James Eives.
1417. Charles Desnos.
1428. James Eives.
1437. Matthew Andrew Muir and James McIlwham.
1450. William Radley.

Sealed August 12, 1856.

362. Pierre Isidor David.
363. John Mills.
391. Edward Oldfield.
394. James Hogg.
397. John Henry Johnson.
402. George Harrison.
455. William Vincent Wallace and Benjamin Lawrence Sowell.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

ERRATUM.

Last Number (No. 1722) p. 126, col. 2, line 9, *for* "fourth prize, and not the third or second," *read* "third prize, and not one of the second."

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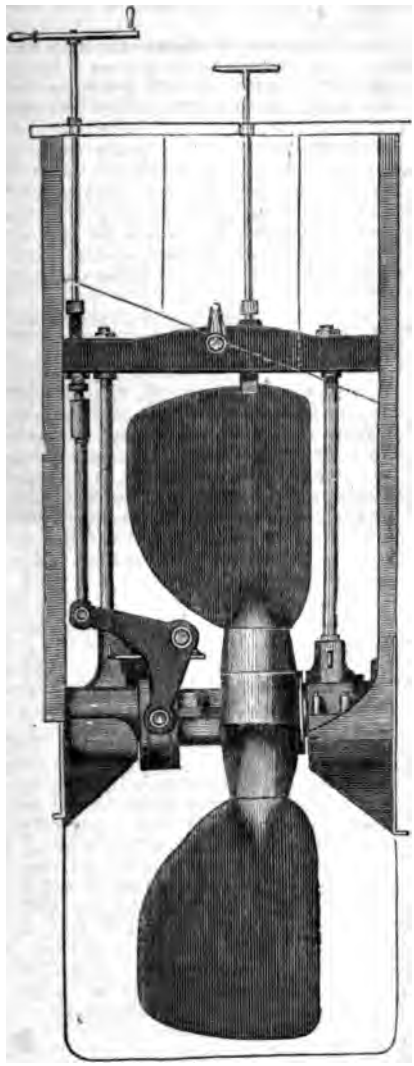
LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, *in the City of* London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, *Dublin*; *W. C. Campbell and Co.*, Hamburg.

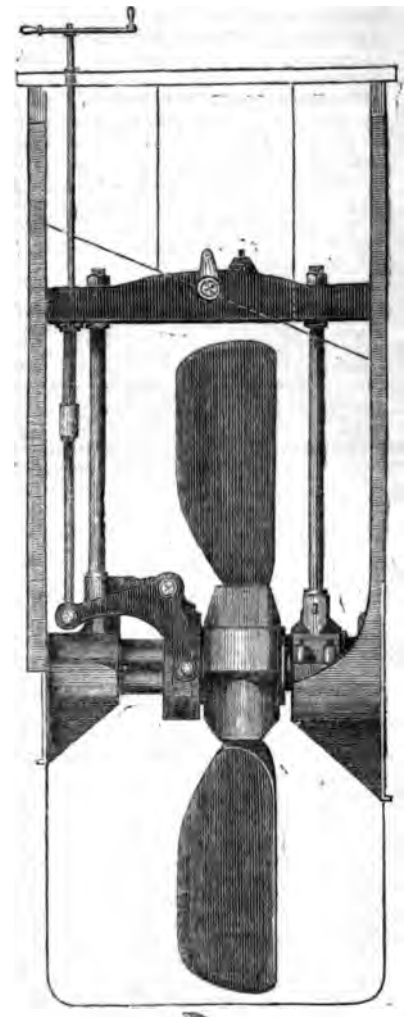
Mechanics' Magazine.

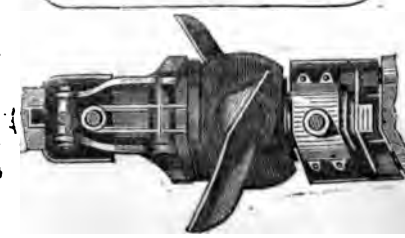
No. 1724.] SATURDAY, AUGUST 23, 1856. [PRICE 3D.

Edited by R. A. Brooman, 166, Fleet-street.

MAUDSLAY'S IMPROVED FEATHERING SCREW PROPELLER.







MAUDSLAY'S IMPROVED FEATHERING SCREW PROPELLER.

MR. JOSEPH MAUDSLAY'S patent apparatus for feathering the blades of screw propellers, patented March 8th, 1848, was for the purpose of feathering the screw blades on their axes so as to place them in a fore-and-aft position with the keel when in a vertical position, so that the vessel might be put under canvas with the least loss of time, and with the least possible risk, without raising the screw out of the water. This principle was fully tested in large vessels on the Indian and Australian voyage, and was found of great service in causing great economy of fuel.

Mr. Maudslay has since that period patented an improved arrangement, which was described in this Magazine for October 1st, 1853, and which consists, in addition to being enabled to place the blades in a fore-and-aft position with the keel for sailing purposes, of the means of varying the pitch at pleasure, as well as combining a lifting frame with the apparatus.

The advantage of the differential pitch for vessels fitted with auxiliary power for long voyages, as effecting a saving of fuel, must be very apparent, as by altering the angle of the blades, the screw may be made to advance through the water at a greater velocity, with a reduced number of revolutions of the engine, thus following up the speed of the ship under canvas, and using the engines with a great advantage. Our reason for drawing attention to this subject at the present moment, by the engravings on the preceding page, is the great interest that is felt in the successful application of auxiliary steam power to large vessels for long voyages.

TONNAGE REGISTRATION, AND MARINE ENGINE HORSE-POWER.

A committee, consisting of the Earl of Hardwicke, Rev. Dr. Woolley, Professor Bennett Woodcroft, Mr. Charles Atherton, Mr. J. Scott Russell, Mr. A. Henderson, Mr. J. R. Napier, Mr. J. Peake, Mr. G. F. Young, Mr. W. Mann, Mr. Anderson, Mr. James Perry, and Captain J. P. Owen, has been appointed by the British Association to consider the question of measurement of ships for tonnage, and continue the investigation already commenced, with the view of supplying the deficiences of the present tonnage registration system, and establishing some standard unit as a measure of marine engine horse-power. It is intended also to present a memorial to the Admiralty, praying for the publication in a simple, uniform, and complete shape, tabular and descriptive, of the results of the trials of Her Majesty's steamships.

ON MERCANTILE STEAM TRANSPORT ECONOMY.*

BY CHARLES ATHERTON, ESQ., CHIEF ENGINEER OF HER MAJESTY'S DOCKYARD, WOOLWICH.

THE construction of ships and the administration of shipping affairs, involving a multiplicity of considerations of a scientific and of a practical and mercantile character connected with these arts, requires that shipping direction be regarded and treated as the subject of an exclusive science; and, of late years, the progressively extended application of steam to maritime purposes, and the prospect of its general use as an auxiliary power, have still further complicated the subject, and extended the range of mechanical acquirement which is now necessary in the prosecution of steam-ship equipment, direction, and management. It is, therefore, with diffidence, and with the feeling of my not possessing the combination of qualifications which is necessary to ensure adequate justice being done in all respects to the elucidation of the important subject, "Steam Transport Economy," that I enter upon the task of bringing that subject before the notice of the British Association for the Promotion of Science. I am, however, encouraged by the assuring reflection that public utility is a field in which it is an honour to labour, that lenient consideration for individual deficiencies and the helping hand of others will be extended to the most humble delvers in that field, and that credit may be earned in proportion to the roughness and obdurate nature of the spot of ground which we may have undertaken to break up, and to the perseverance by which one may at least attempt the accomplishment of the assigned task. Permit me, therefore, to remark that my present appeal to the British Association is but a continuation of my previous efforts in the cause of steam exposition, with a view to bringing "Steam Transport Economy" within the pale of arithmetical calculation;

* *British Association, 1856.*

and as I shall have occasion to refer to the enunciation of principles and to the details of calculations which have thus preceded this essay, it may be convenient that I briefly enumerate the various published statements thus referred to as forming an integral portion of this paper, and which, accordingly, I beg to hand in to the Association for the purposes of reference and record.

1st. A brief essay on "Marine Engine Construction and Classification," published by Weale, in 1851.

The object of this essay was to analyse the data afforded by published and authentic statements of the actual test-trial performances of various steam-ships, and ascertain, by means of such comparative analysis, what are the peculiarities or proportions of build, and what are the peculiarities of engine construction of those vessels which have attained to the highest degrees of locomotive efficiency, thereby also scrutinizing how far the popularly-received notions in regard to steam-ship type and marine engine construction supposed to be most conducive to locomotive efficiency, may be in accordance with, or in opposition to, the results of actual experience, when measured by any definite and received law.

2nd. An essay on "Steam-ship Capability," originally published in 1853, and of which a second edition, with Supplement, was published by Weale, in 1854.

This essay was designed to demonstrate the mutual relations which subsist between displacement, power, and speed in steam-ships; especially as respects the increasing scale of engine power by which progressive increase of speed is attained; and to show the difficulties which attend the prosecution of a steam service in which long passages are required to be performed at a high rate of speed; also to show the sacrifice which attends the employment of vessels of an inferior type of build, as compared with vessels of a superior type. The supplement published with the second edition of this essay extended the tabular calculations to embrace vessels of hypothetical magnitude, and to demonstrate a system of £ s. d. arithmetical calculation applicable to estimating the cost of goods conveyance per ton weight by steam ships, based on the constructive type of the ship, the speed to be realized, and the size of ship employed to do the work. The appendix to this essay embraces a dissertation on the probable capabilities of ships of unprecedented magnitude, showing the advantage of magnitude so far as mechanical principles are concerned, irrespective of mercantile considerations, and under what combinations of speed and distance without re-coaling, comparatively with the more frequent coaling depôts available to smaller vessels, the mechanical advantage of magnitude becomes neutralized; also giving new tables for facilitating steam-ship calculations, by showing the cubes of numbers from 5 to 25, rising by the decimal ·01, and the cube roots of the squares of all numbers likely to be embraced in the tonnage displacement of ships.

3rd. A paper on "Steam-ship Capability," read before the Society of Arts, London, 16th May, 1855.

The object of this paper was to expose the indefinite nature of the terms "horse-power" and "tonnage" as respects their not being what they are generally supposed to be, definite units of measurement of engine power and ships' size, also to show the uselessness for scientific purposes of all statistical data based on nominal horse-power and nominal tonnage, and the fallacy of all calculations based on those indefinite terms; thence showing the necessity for some definite measure of power, being legalized as the unit of power to be denoted by the term "Marine Horse-power," and used as the base of calculation and contract engagement in steam-shipping affairs.

4th. A paper on "Tonnage Registration," read before the Society of Arts, London, January 16th, 1856, with the discussions thereon.

The object of this paper was to show the insufficiency for scientific purposes of the system of tonnage registration now in force as prescribed by the Merchant Shipping Bill of 1854, in so far that under this Act the registered tonnage of a ship affords no certain indication of the tons weight of cargo that the ship will carry; nor does it give, even approximately, the displacement with reference to any given draught; nor does the registration afford any indication of the power capable of being worked up to by the engines of steam ships, or any other data whereby the dynamic properties or locomotive duty of vessels may be scrutinized on scientific principles. By this paper, I brought forward certain suggestions for public consideration and discussion, with a view to our official registration of shipping being rendered more comprehensive for the fulfilment of the various useful purposes to which statistical registration, if complete, would undoubtedly conduce, in a scientific point of view, irrespectively of merely fiscal objects.

These papers, of 16th May, 1855, and 16th of January, 1856, urging the establishment and recognition of definite units as the legal admeasurement of marine engine power and ships' tonnage, I beg respectively to submit to the notice of the Committee appointed by this Association for the consi-

deration of the tonnage question, of which Committee I had the honour of being named a member; but I was under the necessity of declining to take part on this Committee in consequence of my being, as above stated, committed to certain views, and publicly engaged in agitating the question of tonnage registration amendment, with a view to supplying the deficiencies of the present system.

Having thus shown that various investigations essentially connected with the elucidation of the subject now before us, "Steam Transport Economy," have constantly and publicly engaged my attention since 1851, I may now, in the beginning of my paper, announce the proposition to which I hope to direct the attention of the British Association.

Now, what I have undertaken to demonstrate is this: that, in consequence of there being no *legalized* definitions of the terms POWER and TONNAGE as standard units of quantity applied to the prosecution of steam navigation, there is practically no *definite* measure of quantity whatever attached to those terms, even although they are so generally made use of as the base of pecuniary contracts; and that, in addition to the private evils as between buyer and seller resulting from this singular anomaly in matters of mercantile account, the public evils, resulting from nominal "horse-power" and "tonnage" being terms which cannot be scientifically recognized as expressing either the working power of marine machinery or the size of a ship, are monstrous, inasmuch as they publicly defeat science from being brought to bear on steam-ship construction and steam-ship management as a means of investigation and proof whereby to confirm the existence and establish the continued adoption of good practice where good practice does exist, and to detect error either in the construction of steamers or in the management of steamers in cases where bad types of construction and maladministration may exist and be destructive of enterprise which might otherwise have conduced to public good. In short, my object is to show that in consequence of the deficiencies in our national standard units of power and tonnage, and deficiencies of our statistical registration, the public are deprived of the benefits capable of being derived from science as a means of discriminating between good and bad practice in the great matter of shipping, thus enabling us to take advantage of the one and explode the other. The constructive merits of steam ships in a dynamic point of view may be comparatively determined by the ratio that subsists between *the amount* of displacement that is propelled *from place to place, the speed* or time in which the vessel performs the given passage, and the engine power exerted or the coal consumed in the performance of the work; yet every ship that is launched and goes with flying colours upon the usual test-trial, is always for the day pronounced to be the most wonderful ship that ever was built; and no wonder that it is so, considering that the dynamic merits of ships are thus determined, not by any admitted rule based on the mutual relations of displacement, power, and speed, but by acclamation based on the mutual interests of all concerned, that a new ship shall be of good repute. All attempts to expose this monstrous deficiency in our nautical system by urging the importance of statistical registration, have been held up to reprobation as an interference with the shipping interests, regardless of the fact that it is the public who pay the penalty of an enhanced price of goods transport consequent on whatever deficiencies may exist in connection with the locomotive properties of our shipping.

In justification of these remarks as to our denominations of ships' tonnage and engine power being a delusion, subversive of all truth so far as scientific inquiry and research may be based thereon, I may be permitted to adduce the following statements:—

1st. As to tonnage registration. Although tonnage measurement for registration has been subjected to legislative revision under the Merchant Shipping Act of 1854, the term "tonnage" is still made use of in various significations. By the present law, 100 cubic feet of internal roomage, or available space for cargo, constitutes the unit of tonnage; but as respects all ships built previously to the month of May, 1855, when this Act came into operation, the adoption of this law is not compulsory. Merchants have the privilege of retaining the former registration of some ships, and getting such others of their ships measured and registered under the new Act as they may think fit to select for re-registry, so that the term tonnage may now signify "builders' tonnage," old measure, under the Act of 1733, or tonnage under the Act of 1833, or tonnage under the Act of 1854, and these are three totally different systems of admeasurement, having no definite ratio to each other. Moreover, the unit of tonnage under the Act of 1854 being based on internal roomage *measuring up to the deck*, affords no certain indication of the displacement of a ship when loaded fit for sea, nor does it afford any assurance whatever as to the tons weight of cargo that a ship will carry; for example, by adopting the cellular principle or build now introduced in the construction of iron ships, a ship of 10,000 cubic feet of internal roomage, or 100 tons register ton-

nage, may have such external displacement as would safely float with the whole internal roomage filled with iron, and therefore weighing no less than 1,000 tons of dead weight, or ten times the register tonnage; and the registration of steam-ships is open to similar delusion as to their capability for weight of cargo. So much for the mercantile liberties that may possibly be introduced and taken with our statistics of exports and imports so far as they may be based on the tonnage registration of shipping under the Act of 1854.

The abortiveness for statistical and scientific purposes which has hitherto attended all legislation on tonnage registration, appears to have been occasioned by the attempt to embrace under the one term, "Tonnage," two things which have no fixed ratio to each other, namely, tonnage by bulk and tonnage by weight. The law has not comprehended the double mercantile use and application of the term "ton" by providing for the separate and distinct registration of each, namely, tonnage by bulk and tonnage by weight, the capability of ships for bulk tonnage being dependent on internal roomage, but the capability of ships for weight tonnage being dependent on external displacement, a distinction which is not noticed by the new law of tonnage admeasurement under the Act of 1854.

2nd. As to marine engine power. Although Watt originally defined the unit of power, which he denominated horse-power, as equivalent to 33,000 lbs. weight raised one foot high in one minute of time, and invented a mechanical device or instrument called a "steam indicator," whereby the variable pressure of the steam in the cylinder, and consequently the working power of steam engines could ber eadily ascertained (whence the working power so ascertained was denominated the "*indicated* horse-power"), all which arrangements of Watt put the working operation of the steam engine originally on a scientific base, defined by a standard unit of power admeasurement; still this definite unit of power was never recognized by law, and consequently the steam engine was no sooner applied to maritime purposes than the rivalry of trade induced a practice under which the nominal or contract power of engines did not specifically regulate the working capability of the engine delivered. Engines were not objected to by the purchaser if their working capabilities were in excess of the nominal power, and engineers themselves voluntarily supplied marine engines working up to an "*indicated*" power far in excess of the "*nominal*" power, for the purpose of thereby driving the new vessel at a higher rate of speed than that attained by some rival vessel with the same nominal power. Reputation for the production of fast steamers depended on beating the rival boat, not on the mode of effecting that object. The shipping interests and their working craftsmen, shipwrights and engineers, felt themselves constrained to meet their rivals in trade with their rivals' weapons; numerous devices have been adopted with a view to the development of power on board of ship by packing the greatest amount of engine power into the least space, and undoubtedly great improvements have been made by adapting the dimensions and proportions of vessels to the service required; but still "Fame" in regard to the character of steam-ships based on speed has been too much the result of horse-power delusive jockeyship rather than of truthful science. By the practice of trade, horse-power came to be measured by the diameter of the cylinder, without any limitation as to the capabilities of the boiler, and gradually in time a marine engine contract was considered not to be fulfilled unless the engines were capable of working up to an "indicated horse-power" at least double that of the contract nominal power; still, however, no specific limit was assigned either by custom or by law, and, at length, to such a degree has competition set truth at defiance, that the working, or "indicated horse-power" of engines delivered under contract has frequently amounted to four times the nominal horse-power actually stipulated for by the contract. These facts are fully set forth in the paper read by me before the Society of Arts on the 16th May, 1855.

Having thus pointed out the indefinite application in steam-shipping practice of the terms "tonnage" and "horse-power" with reference to the definite terms "displacement" and "indicated horse-power," it may be still further edifying that we illustrate the anomalies liable to result when these terms are used in combination with each other, as is constantly the case in expressing and recording the ratio of tonnage to power of a steam-ship. In exposition of this matter, I may again refer to the beforementioned paper, whereby it will be seen that I selected ten vessels, in each of which the ratio of builders' tonnage to nominal power was very nearly the same, namely, in the ratio of 100 tons of builders' tonnage to 40 nominal horse-power, or 2½ tons of tonnage to one nominal horse-power; but, on comparing the constructors' load displacement of these same ships, calculated in tons weight at 35 cubic feet of water to the ton, with the *effective* working power based on indicator measurement, the ratio was found to be 100 tons displacement to 38 horse-power in one case, and 100 tons displacement to 281 horse-power in another.

The recorded statistics of these ten vessels would lead one to infer that they are all powered in the same proportion of engine power to size of ship; but, in fact, they are all different, and on comparing the two extremes, one ship has no less than seven times the power of the other, in proportion to size of ship as determined by displacement. In fact, generally, the records of register tonnage and nominal horse-power do not constitute statistical data of any value whatever for the scientific purpose of discriminating between the relative dynamic merits of steam-ships, but, on the contrary, such records, and all ideas resulting therefrom, are positively delusive and mischievous. The conclusion at which I would arrive from these statements is, that the very first step in any attempts to bring steam affairs within the range of arithmetical calculation must necessarily be to establish the measure or value which we assign to our units of tonnage and power. It is only by the moral influence of such a body as the British Association that the cause of science can obtain a hearing in this matter of statistical registration applied to shipping. With reference to our units, it is, of course, desirable that the measure of the unit, to be legally recognized as the unit of power, should be nearly in accordance with the general average of practice at the time when the unit may be so established; and as at the present time (1856) the general run of marine nominal horse-power varies from two indicated horse-power to four indicated horse-power, that is, from 66,000 lbs. to 132,000 lbs. raised one foot high per minute, it is submitted that the unit of marine horse-power would now be most conveniently fixed at 100,000 lbs. raised one foot high per minute. Until, however, some definite measure of the unit be legally recognized it is considered advisable in matters of scientific inquiry like the present to adhere to the measure of the unit originally proposed by Watt, namely, 33,000 lbs. raised one foot high per minute, designating this scale of measurement as the "indicated horse-power," thus:—Ind. h. p.; and such will be the unit referred to when horse-power is spoken of in the following pages of this paper.

Now, as to the measure of the unit of tonnage by which the sizes of ships are to be spoken of and compared, we have already observed that under the Merchant Shipping Act passed in the year 1854, the unit of tonnage is based on the internal roomage of ships available for cargo; that all ships built since May, 1855, are registered under this Act; but the re-measurement and re-registration of ships built previously to *1855 is not* made compulsory. Shipowners *have the privilege of re-registering*, under the Act of 1854, such vessels as they may select for that purpose; consequently our present registration is mixed, and the various units of tonnage measurement thus embraced under our present tonnage registration have no definite ratio to each other, or to the tons weight of cargo that ships will carry. The comparative merits or demerits of these various systems of registration for *fiscal* purposes need not be here discussed; suffice it to say, that in none of these systems has any notice whatever been taken of the measurements which constitute displacement; and as displacement is an essential element in any scientific investigation as to the locomotive performance of steam ships with reference to the power employed and speed attained, it follows that our present registration of shipping, even under the Act of 1854, does not afford statistical data of such a character as to be available for science in the matter of comparing the merits, in a locomotive or dynamic point of view, of the various models or types of form by which steam ships have been constructed. It is submitted for the consideration of the British Association that national advancement in maritime affairs, especially in regard to transport economy, would be promoted by our public registration of shipping in general, and of steam shipping in particular, being so systematized as to embrace not only the roomage measurement required for fiscal purposes, but also, in addition, those details of *displacement* which, in combination with the data of speed and power derived from the actual performances of ships, are necessary to scientific investigation in determining the relative dynamic merits of different types of form of steam ships. It must be borne in mind that it is the public, the consumers of merchandize, who must ultimately bear all the expenses connected with the transport and delivery of merchandize, whether well or ill performed. Bad ships individually enhance the average cost of imported corn and all other consumable merchandize. Bad ships also enhance the price of cotton and all other similar raw material imported for the production of export manufactures. This enhanced price restricts demand, thus curtailing the sources of employment; so that every bad ship, whether employed in the import or export trade, is of itself a public nuisance. A prevalent bad type of ships would be a public calamity, and progressive improvement would be a public benefit. It has been said that the interests of shipowners is in itself a sufficient guarantee for insuring the adoption of the type of ships best adapted for mercantile steam transport economy. It is scarcely fair to base any argument on interested motives, but as that

argument has been raised it must be noticed. Undoubtedly each shipowner has an individual interest in his own ships being the best afloat; but if he does possess the best ships, it is equally his interest to keep that fact, and the means of acquiring them, to himself, so that the charges for freight may continue to be ruled by the inferior dynamic qualities of the average ships employed by the trade, not by the superior dynamic qualities of the best ships as possessed by himself, the difference being the shipowner's private advantage or the public's loss. It is, therefore, the interest of the public that all bad types of shipping be exposed and eradicated. Freight would then, as respects the quality of ships, be ruled by a scale of charges derived from the performance of a generally improved type of ships working in fair competition with each other.

(*To be continued.*)

NEGRETTI AND ZAMBRA'S MERCURIAL MINIMUM THERMOMETER.*

BY DR. LEE.

THIS thermometer has a bulb of very large size, consequently allowing a tube correspondingly large in the bore for that part forming the scale. On the surface of the mercury enclosed in the tube is placed a small steel needle, pointed at both ends, which forms the index. This conical needle is capable of moving freely in the bore of the tube, and as the mercury descends therein will of course fall with it; but when the mercury ascends in the tube the mercury will pass the lower pointed end of the needle, and rise above the same without raising or moving the needle.† This latter will, therefore, remain stationary, and, consequently, its upper point will indicate the lowest temperature to which it has descended during the twelve or twenty-four hours, and will not be affected by any subsequent rise in temperature. To reset the thermometer for future observations it is necessary simply to turn it in such a position that the mercury and needle in the tube will flow into the reservoir at the top; but should the needle not freely flow with the mercury, it may be assisted by a magnet, and readily held there until, by re-turning the thermometer to the upright position, the mercury flows back again into the tube, and then, with the magnet, the needle may be returned to the surface of the mercury ready for future observations. One of these thermometers has been in the hands of the Secretary of the British Meteorological Society; another at the Royal Observatory, Greenwich; a third at Mr. E. J. Lowe's observatory, Highfield-house; and others have been used by various members of the British Meteorological Society, all of which have acted most accurately, and in two instances corrected errors in the alcohol minimums which otherwise would have passed unnoticed.

* British Association, 1856.

† This thermometer was patented October 15, 1855, and described somewhat more completely than above, in some respects, at p. 544 of our Number for June 7, 1856, No. 1713.—ED. M. M.

WETHERHED'S METHOD OF SUPERHEATING STEAM.

THE method invented and introduced by Mr. Wetherhed, late member of the United States' Congress, for superheating steam, has been submitted to various trials during the last six months, in the dockyard at Woolwich, and has at length assumed a practical form. During the series of experiments to which the system has been subjected, various improvements were suggested from time to time, and it was, therefore, considered advisable to prolong the trials, and if possible to render the system complete. The method was first tried in the *Black Eagle*, Admiralty yacht, and was attended with a considerable saving of fuel; and before the late voyage of the *Dee* to the western coast of England, the machinery was fitted up with the appurtenances necessary for a further test of the system. The apparatus was at work on alternate days during the voyage, which was specially extended for the purpose, and the results obtained exceeded what was anticipated. The economy realized in fuel amounted to no less than 30 per cent. as compared with the ordinary system of using steam. The apparatus consists of iron pipes carried from the steam pipe along the front of the tube plate, and extending into the uptake or chimney, in which they are coiled to increase the surface. These pipes rejoin the steam pipe at or near the cylinders. Part of the steam passes through these pipes, and becomes considerably heated—superheated, as engineers say—and, combining with the ordinary steam before entering the cylinders, brings the mixed steam to about 340° Fahr. It is in this method of passing part of the steam used through coiled pipes in the uptake, and combining it with the common steam, before entering the cylinder, that Mr. Wetherhed's invention consists. The system of simply superheating without mixing the steam has been known for some time past, and has been attempted on many occasions, but without much success. In the first course of the experiments at Woolwich a difficulty existed, namely, the burning and consumption of the wadding. This difficulty has, however, been got over.

PREVENTING STEAM BOILER EXPLOSIONS.

FUSIBLE PLUGS.

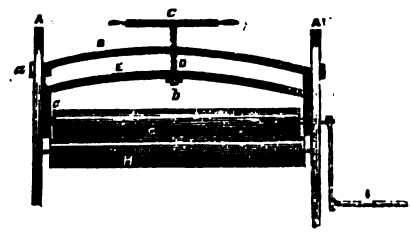
Two improved methods of applying fusible plugs to steam boilers, for preventing explosions, and giving signals when the water falls too low, have recently been introduced. The first is that of Mr. T. F. Uttley, of Mytholm Royd, York. It consists in applying the fusible plug in the lower extremity of a tube, part of which tube projects into the space above the fire, or into the flue, the other part ascending into the boiler. By this means, when the level of the water in the boiler descends below the level of the upper part of the tube, the water in the tube is evaporated before the level of the water in the boiler descends sufficiently to leave the boiler plates uncovered; consequently the fusible plug is melted, and the signal given before any injury is done to the plates of the boiler or flue. The fusible plug is so secured to the tube in which it is fixed that the lower part of the plug shall approach or descend below the lower part of the plate to which it is connected.

The second method is that of Mr. W. Routledge, of Newbridge Brass Foundry, Salford, whose apparatus consists of an elbow pipe connecting the furnace with the side flue, and is fixed just below the water level in the boiler (or at any elevation, or in any position requisite). The pipe is perforated with a number of holes, about half an inch in diameter, so placed as to be subject to the immediate action of the furnace fire. In these holes are the metal plugs, more or less fusible, according to the working pressure of the boiler. When the water in the boiler, from neglect or otherwise, falls below the level, and leaves this pipe bare, the heat from the furnace acts upon the plugs, which melt, and the steam, escaping through the holes, immediately relieves the pressure in the boiler, and in a short time extinguishes the furnace fire.

BARBER'S PATENT MANGLES.

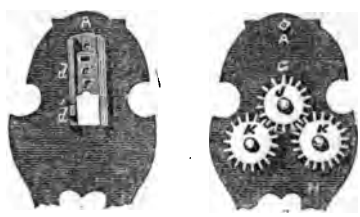
An improved form of roller mangle, patented in 1855 by Messrs. Barber, Butterfield, and Austin, is now manufactured by Mr. J. Butterfield, of Berkhampstead, Herts., and is well adapted for use in families, &c. Fig. 1 of the accompanying engravings is a front elevation of one arrangement of the improved mangle with three rollers; fig. 2 is a left-hand inside end elevation of one standard of the frame; and fig. 3 is a right-hand outside end elevation of the opposite standard of fig. 1. A, A, are the standards of the framing, connected at top by means of the metal bar or bridge, B, secured at its ends, *a*, *a*, with screw nuts; C, is a wheel with handles for turning the tightening screw, D, working through B,

Fig 1.



and carrying at its end, *b*, the strong bent spring bar, E, the ends of which at *c*, *c*, are inserted in a slot, *c*, cut to receive them in two sliding metal blocks, formed like F, fig. 2, which works in two grooves, *d*, *d*, on

Fig. 2. Fig. 3.



the within side of each standard, serving when screwed down to press on the axis of the cloth roller, G, and when drawn up-

Fig 4.

wards by D, allowing the same roller to be taken out through the side slot, *d*, whenever required. H is one of the driving and

smoothing and polishing rollers, of which there are two. This mangle is operated by the winch-handle, I, which works direct from the axis of a toothed pinion secured to the outside of the end standard of the frame, and is geared into toothed pinions, K, K, attached to the elongated axes of two driving rollers, H, passing through the standard A.

The improved mangle is manufactured in various forms. In some, called cabinet mangles, the external appearance is that of a chest of drawers; in others drawers are fitted below the rollers. The latter is shown in fig. 4. In both instances they answer the double purpose of a useful and ornamental piece of furniture; and the only space required for working them is that which they occupy when out of use. Their action upon linen is superior to that of the ordinary reciprocating mangle, and their construction is such that their cost is small.

Hand-Book of Natural Philosophy. By Dr. LARDNER, D.C.L., &c. Electricity, Magnetism, and Acoustics. With Three Hundred and Ninety-five Illustrations. London: Walton and Maberly. 1856.

WITH this volume Dr. Lardner's admirable "Hand-Book of Natural Philosophy" is concluded. We are gratified to be able at the same time to announce that it is to be followed by a "Hand-Book of Astronomy," in two similar volumes, in September and October.

We know of no English works in which the *facts* of science are more accurately recorded, or the *theories* of science more lucidly stated, than in these by Dr. Lardner. We do not, indeed, believe it possible to compile treatises better adapted than these to instruct the reader in all that can be learned of natural philosophy without the aid of abstruse studies, within the limits which the author has here prescribed to himself.

On glancing over this volume, with the preceding ones of the series, we can detect but one important fault, and that appears to be the too great prominence which is given to French apparatus at the expense of English, and in some cases at the expense of useful information. For example, in this fourth volume several electro-motive engines of MM. Froment and Bourbouze are fully described, while all of them are, we think, inferior to some that have been invented by Englishmen. We do not doubt, however, that much might be stated in mitigation of our judgment on this point.

The publication of the four volumes of this Hand-book — *written by one of the ablest English scientific writers, beautifully* and elaborately illustrated, and well bound —for twenty shillings, is one of the most remarkable literary circumstances that has recently come under our notice. It is much to be desired that they may be widely circulated, for they are well calculated to extend that kind of scientific knowledge which our populations, high and low, are greatly in need of.

A Popular Inquiry into the Moon's Rotation on Her Axis. By JOHANNES VON GUMPACH. With Numerous Illustrative Diagrams. London: Bosworth and Harrison, 215, Regent-street. 1856.

No person on observing this title would surmise that Herr Von Gumpach writes to prove that no such thing as "the moon's rotation on her axis" exists. Yet such is the fact, and we have before us a volume of nearly 200 pages, beautifully printed on excellent paper, very neatly bound, and furnished with a considerable number of carefully executed woodcuts, its sole object being to "prove the most eminent philosophers and the greatest mathematicians of this and the past century to have been in error" respecting this question—Does the moon rotate on her axis? When an individual is found to go the length of preparing and publishing a costly volume in a foreign land with such a chimerical end as this in view, who shall wonder at the ardour and self-sacrifice with which the developments of true science are sometimes promoted!

We have to announce to the scientific world that the lunar heresy is spreading; or rather, that it is more widely spread than is generally supposed. The letters in support of it in the *Times*, the previous letters in this Magazine, Mr. Jelinger Symons' papers in the Educational Journals and before the British Association*—all these constitute but a portion of what has recently been written in its furtherance. We have before us at this moment, from the pen, or rather from the printer, of one gentleman only, the following papers of the same character: "On the Misuse of Technical Terms—Ambiguity of the Terms Rotation and Revolution;" "Notes on the Kinematic Effects of Revolution and Rotation, with reference to the Motions of the Moon, and of the Earth,

* An abstract of Mr. Symons' British Association paper has been in our hands for some time, but it is so very ill written, that its publication could serve no useful purpose. We have reason to believe that its defects are, to a great extent, due to the circumstance that it was drawn up in extreme haste, and during excitement resulting from severe affliction in the family of the author. We make this statement without the participation or consent of Mr. Symons, but we think justice to him renders it necessary, particularly as some, at least, of those who accept his doctrine have received the paper referred to with disfavour.

which are assumed in the present System of Astronomy, with Experimental Illustrations;" "Notes on the Revolution and Rotation of the Moon," with an "Appendix" to the same, &c. Nor is the author of these tracts deficient of culture; on the contrary, he writes with skill and literary accuracy, and is, moreover, the author of other papers which evince considerable mathematical attainments, and which have been recognized by high mathematical authorities. And now, in the book before us, we have the mystic light of the German mind beaming forth to invest the doctrine of the minority with additional charms.

Nor, indeed, does the matter stop here. The astronomers are not wrong with respect to our satellite only; their errors are more in number than one, and they extend far beyond the glimpses of the moon. One gentleman darkly hints to us in private that we may expect wonderful astronomical revelations and revolutions ere long; another sardonically smiles in silent anticipation of coming surprises; and Herr Von Gumpach's "proof of the moon's *non*-rotation, and his explanation of the phenomena on which the prevailing doctrine of the rotation of our satellite is based, involve ulterior consequences *amounting to little short of a revolution in modern astronomy*."

It may also be remarked that the astronomical reformers are beginning to complain of the tone adopted by some of their conservative opponents, and to remind the public of the vitality of *truth*, and to deprecate persecution. We attach but little importance to this feature of the case. For our own part, we guarantee them all necessary consideration; at the same time we recommend them to remember that we cannot permit ourselves to be paralysed while confuting and resisting any particular error, by the mere fact that truth has often been unwisely and unnaturally obstructed.

We must now offer a remark or two on the work before us.

That the author is either shallow or disingenuous is shown very early in it—on the second page, in fact. In attempting to prove that the question of the moon's rotation or non-rotation is an extremely difficult one, he there says:

"'To determine,' the immortal author of the *Principia* remarks, 'the exact position of the moon's axis in regard to the fixed stars, and the variation of this position,'—*two of the principal elements on which the solution of our question depends*,*—'*is a problem worthy of an astronomer.*'"

Now every reader of this Magazine must know perfectly well not only that "our question" (of the moon's rotation or non-rotation) does not depend *principally* upon the "EXACT POSITION *of the moon's axis in regard to the fixed stars and the variation of* THIS POSITION," but also that it does not depend upon these at all, and that it is absurd to suppose that it does: for whatever this "exact position" may be, and whatever may be its variations, the fact of the moon's rotation is apparent, and would indeed be so were even the supposed inclination of the moon's axis to the plane of the orbit to be itself proved not to exist.

After reading through several pages, explanatory of the terms "rotation" and "revolution," we come on page 19 to the first of the illustrative diagrams; but unfortunately, although the diagram is a very good one, the language in which it is described is to us quite unintelligible, containing such expressions as these: "In which the points, A B C, shall indicate the direction of the corresponding points, *a b c*, in the axle." "The points, *a b c*, in the axle will maintain the same direction, and continue to regard the corresponding points, A B C." Whether Mr. Evan Hopkins, or Mr. Jelinger Symons, or any other non-rotatory authority will understand what is meant by one point indicating the direction of another point, and by certain points regarding* certain other points, we do not know; if they should, their powers of riddle-reading greatly exceed our own.

On page 25 we have a diagram of a sphere which revolves in a circle, and also an argument which follows a similar track. The author here supposes a spherical body "to move, *without rotation*, upon the surface of a much larger spherical body," and contends that that diameter of the smaller sphere, which at starting pointed towards the centre of the larger sphere must always point to that centre; because, says he, if the point which at first formed the outer extremity of the said diameter of the smaller sphere were no longer in the straight line passing through the centres of the two spheres and their mutual point of contact, "the point of contact could be no longer the same; *and the point of contact having changed, there must have been rotation*." Of course Herr Von Gumpach is at liberty to assert, if he please, that "the point of contact having," under the above circumstances, "changed, there *must* have been rotation" (and, of course also, Mr. Symons and Mr. Hopkins are at liberty to believe him, if they are sufficiently credulous); but, at the same time, we distinctly state that his assertion is incorrect, and that the point of contact might and would change continually

* *The italics here (in the parenthetical remark), and here only, are ours.—Ed. M. M.*

* The English "regard" is evidently understood by the author to be synonymous with the French regarder; but this is not the case here.

during the motion of the one sphere upon the other, *when no rotation existed.*

In his letter to the *Times*, and again, in his article on "The Lunar Rotation," in the *Mechanics' Magazine* for August 2, Dr. Lardner says: "The same reasoning which proves the moon to rotate on its axis must establish with equal conclusiveness the rotation of the Peak of Teneriffe upon a certain line as an axis of rotation, that line passing through the mass of the mountain in a direction parallel to the terrestrial axis, the time of rotation being 23 hours 56 minutes." Herr Von Gumpach comments upon this statement in a lofty and triumphant tone, in the following passage (which many of his acuter partizans would be glad, we think, to see expunged). "From Dr. Lardner's proposition," he says, "it would follow that, supposing we are stationed at a safe distance from the Peak at the moment its summit has reached its greatest elevation, we should see it, independently of the rotation of the earth, move slowly round; after six hours strike its head through the plain; after six more hours reach what is commonly believed to be the *usual* position of its base, now exposed to the view of the heavens; after six further hours reappear above ground; and after a lapse of 23 hours 56 minutes resume its first position, in order to instantly leave it again on a similar errand..... Can it be expected that common understandings will readily admit this upon the force of the received demonstration? Nor will reason admit such theories upon *any* demonstration. They are *false* teachings, proclaimed only *in the name of* Science. *Science* disowns them."

This passage is wholly unintelligible, and must operate either against the writer's candour, or against his ability. But in order to give him all reasonable credit, we will assume that by the words "independently of the rotation of the earth," he intends to imply "supposing the rotation of the earth, and therefore the translation of the mountain, to suddenly cease." Now, while every intelligent man of science must be aware that if the rotation of a globe 8,000 miles in diameter, moving round once in 24 hours, were suddenly stopped (whether by a physical obstacle, or a divine fiat, does not matter) results of a most extraordinary character would inevitably ensue; yet we are perfectly certain that no one, but Herr Von Gumpach, would include among these results the phenomenon of a mountain excavating a path for itself through the solid earth beneath it, and after sinking its summit deep in the soil, uplifting it again to the heavens; and that too wholly unimpeded, and with a velocity wholly undiminished by the resistance of the earth through which it passed. We can conceive the earth's rotation suddenly ceasing, and we can conceive the necessity of a spectator removing himself to a pretty considerable distance, not only from the Peak of Teneriffe, but from the earth itself, when it did so; but Herr Von Gumpach's magic mountain-motion we cannot conceive to be possible, nor does it at all follow from or comport with the principles enunciated by Dr. Lardner and other astronomers.

On page 52 we have a very pretty specimen of the modesty with which the author addresses the public. He says, "That the moon always presents the same face to the earth while revolving round her, is an indubitable proof, the majority argue, that she rotates on her axis. That the moon does *not* rotate on her axis is indubitably proved, argue the minority, by her always, whilst revolving round the earth, presenting the same face towards her." He then asks, "How is this logical paradox to be explained," and furnishes an answer, in which he explains it "in the simplest manner possible," as he remarks. And what is his answer? Is it that Mr. Evan Hopkins, and Mr. Jelinger Symons, and the rest of the "minority," are in ignorance of the real merits of the question? Or that they are perverse, and will not acknowledge their error? Or that they are presumptuous, and *will* fling a crotchet of their own in the face of the most eminent philosophers of modern times? No! The *simplest* explanation is, that "Astronomers generally, with very few exceptions, are in ignorance of the real merits of the problem." We cannot deny the *simplicity* of the explanation; it is indeed great, although not so great as the simplicity of him who expects the public to listen to it without derision. "Astronomers generally," may be wrong on many points; but it will require a little more than the mere word of Herr Von Gumpach to convince the world that they are so. We would recommend the imbibition of a little modesty to him and his revolutionary colleagues; but, unfortunately where modesty is lacking, all disposition to acquire it is commonly absent.

It would not be fair to the author if we concluded this notice of his work without stating that it contains many investigations of much pretension, and copious references to such authorities as Newton, Lagrange, Laplace, the Herschels, Humboldt, Kepler, &c., all of whom he, of course, corrects. We have, however, read through the greater part of his investigations, without acquiring any tendency to iconoclasm.

On the other hand, it would not be fair to Mr. Symons, Mr. Hopkins, and Mr. Perigal, if we concluded without stating that the work will scarcely prove pleasant

to their respective tastes, for the author does not scruple, at times, to oppose every one of them.

How strangely do the opinions of persons respecting the same thing differ! Herr Von Gumpach fancies that the book before us is an able confutation of a theory held by the first philosophers of the age; we believe it is a confirmation of the fact that there is no folly too great for some persons to squander their talents upon.

Prize Essay on the Prevention of the Smoke Nuisance. By CHARLES WYE WILLIAMS, Assoc. Inst. C.E. London: John Weale, 59, High Holborn. 1856.

(*Continued from p.* 156.)

This leads to a close examination of the two bodies engaged, namely, the gas of the fuel, and the air, and the absolute necessity for providing *precise quantities* of each, to produce a given result. As an illustration of this necessity, reference is made to the action of the lungs in the process of respiration. The two elements brought into action in the lungs are, the blood and the air. In the furnace, they are, the gas and the air. The relative proportions of these are thus stated:

75 pulsations = 150 oz. of blood = 450 cubic inches of air.

100 lbs. of coal = 500 cubic feet of gas = 5,000 cubic feet of air.

The inference is, that unless the gas or the blood has its full equivalent of air, combustion can no more be effected in the furnace, than respiration in the lungs.

As to the absolute quantity required, Mr. Williams observes: "It has been shown (section 6) that in round numbers *the gas* of a ton of bituminous coal measures 10,000 cubic feet of gas, requiring 100,000 cubic feet of air; while *the coke* portion of the same ton will require a further amount of at least 200,000 cubic feet; the gross volume of 300,000 cubic feet being thus absolutely required for the use of each ton of coal." With these unquestionable chemical facts before us, the essayist asks, What can be said of those practical men who altogether overlook these considerations, or repudiate the necessity for taking the measurements and equivalents given into their calculations?

In opposition to the prevailing custom of determining the relative proportions of the several parts of the furnace *before* ascertaining the results which it is intended to effect, Mr. Williams proposes—1st, to rigidly examine the duties of each part of a furnace or boiler respectively; 2nd, from these to determine their relative sizes, areas, and other details. This examination he *takes under the following* heads:

1. Of the chamber of the furnace above the fuel.
2. Of the ash-pit and space below the fuel.
3. Of the mode of introducing the air.
4. Of the quantity of air required.
5. Of the passages through which the products escape.
6. Of the length of flue, or run.

Here the essay enters practically as well as chemically into the question, and here the engineer and boiler maker are alike interested. A short comment on each of these heads may assist the inquirer.

1. Of the chamber of the furnace above the fuel. It is shown that this chamber from its very small area, in ordinary furnaces, is wholly unadapted to the several processes which are to be carried on within it. A contrast is drawn between what ought to be the size, and the prevailing practice of making it long, narrow, shallow, and cylindrical.

The essay here points to the practical error in speaking of the want of *boiler space*, or the system of *forcing the boilers*, while what is really meant is, the want of *furnace* space, and the forcing of the *fires*. The absence of this distinction is shown to lead practical men astray.

2. Of the area of the ash-pit below the fuel. The same errors as were seen in the preceding case re-appear here, and the same reasoning is shown to be applicable to it.

3. Of the *mode* of admitting the air to the gas in the furnace chamber. On this, it is stated, depends the important question whether the air will produce a cooling effect, or the reverse, by causing a more immediate combustion, and consequently a more rapid development of heat.

4. Of the admission of the required quantity of air as it influences the draught. This branch of the inquiry, as regards the proportions of the furnace and its flues, is shown to be almost wholly overlooked; and, unquestionably, there is an anomaly in practice which should be removed. *Land furnaces* are invariably accompanied with tall chimney stacks of 100 to 200 feet high; whereas, in marine furnaces, though of far greater dimensions, the height of the chimney is confined to an average of 40 feet; yet the question of draught is not considered as influenced by this reduced elevation.

The essay goes on then to explain the reason why, in marine furnaces, there must either be a *high* chimney or a *hot* one, the former being unattainable in a steam vessel, and the latter only obtained at a ruinous waste of heat. All this assuredly calls for further investigation, and the more so as marine power is now so much increased, and as the cost of carriage so im-

peniously demands economy both of fuel and space.

5. Of the passages through which the products of combustion have to pass. Here the essay exposes another great error in the prevailing practice, and particularly with reference to that peculiar part, *the throat*, or space above the bridge, through which the entire products of both the gas and the coke of the coal must necessarily pass. The essay states that the area of this is, generally speaking, too confined, not unfrequently indeed being less by one-half than it should be, in order to pass the enormous volume of those products. The cause of the error is supposed to be the underrating of the true quantity of air required, so that when the full supply is admitted to both the gaseous and solid portions of the fuel, the area for escape of the products is wholly unequal to their discharge, and consequently both cannot have their due equivalents. If the proper quantity obtain admission to the *gas* in the chamber, a commensurate reduction must of necessity take place in the supply by the ash-pit, or *vice versâ*. Thus it is shown that in correcting the evil of the formation of smoke, by reason of an imperfect combustion of the gas, another will be created in the reduction of steam for the engine from the diminished combustion of the solid or coke part of the coal.

The true quantity of air required does certainly appear to be much greater than practical men have thought necessary. "From a ton of coal, where the due quantities of air are introduced, the volume of its products cannot be less than a *million cubic feet*, a volume which would fill a tube of 12 inches square, and 200 miles long." This is a startling estimate, and one which, we apprehend, has not entered into the calculation of modern boiler makers or patentees; yet the calculation is within the reach of all. Here, then, is shown the absolute necessity of providing not only for the *ingress* of the proper quantity of air, but also for the means of *egress* of this great volume of gaseous products. We may remark, that these calculations and conditions are not to be found mentioned in any of our elementary works.

We here give a table indicative of the relative areas which should be given to the throat of the furnace and the grate-bar surface.

"Supposed length of furnace.		Width.		Gross area in square feet.		Area in inches per square foot of furnace.		Required gross area in inches at the throat.
2 feet	×	2 feet 6 inches	=	5 square feet	×	24 inches	=	120 inches
3 „	×	2 „ 6 „	=	7 feet 6 ins.	×	24 „	=	180 „
4 „	×	2 „ 6 „	=	10 feet	×	24 „	=	240 „
5 „	×	2 „ 6 „	=	12 feet 6 ins.	×	24 „	=	300 „
6 „	×	2 „ 6 „	=	15 feet	×	24 „	=	360 „ ."

In this table is suggested a short practical rule for ascertaining the proper relation between the area or size of the furnace and that of the throat over the bridge, by which all may at once ascertain the correctness of their area furnaces in this important point. If found to be disproportioned, it will be in vain that they apply to patentees or smoke-burners. The one radical fault of a disproportioned furnace in this respect must render inoperative any attempt at cure.

(*To be concluded in our next.*)

ROTATION.

To the Editor of the Mechanics' Magazine.

☞ Sir,—Having read some of the articles, letters, and pamphlets, of those who object to the way in which the words *Rotation* and *Axis of Rotation* are applied by mathematicians and astronomers, it appears to me that two causes are at work in the minds of the objectors.

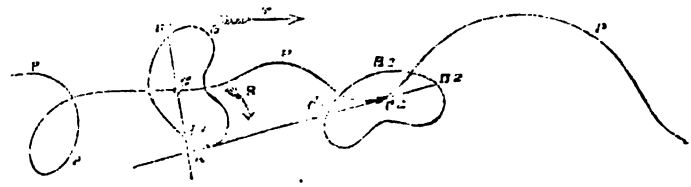
In the first place, some of them fail to perceive, that the speaking of any solid body (such as the moon), having at the same instant two motions, one of translation and the other of rotation, is not an attempt to assign a cause to the motion of that body, but is merely a mental analysis or decomposition of its motion into two parts or components, for the sake of more easily reasoning about it.

The motion of a solid body is *one phenomenon;* but it may be mentally analysed into two parts, viz:—First, *translation* or *shifting*, being a motion of all the particles of the body with equal velocities, and along lines, straight or curved, which are all equal and similar, and at each instant of the body's motion all parallel; and, secondly, *rotation* or *turning*, being the only kind of motion of the particles of a body *relatively to each other* which is consistent

with the preservation of its original volume, figure, and structure. If the motion of a body consists of nothing but translation or shifting, then every diameter of that body continues always parallel to its original direction. If the motion of a body, as a whole, consists of nothing but rotation or turning, then the centre of that body's mass has no motion of translation, and one diameter of the body (called its axis of rotation), *may* be fixed in direction and position; but every other diameter changes its direction, and every point in the body, except its centre of mass, has a motion of translation round the axis.

When the centre of a body's mass moves, and its diameters at the same time change their directions, then, although the motion of that body be still but one phenomenon, it may be analyzed into *shifting* and *turning*; the shifting or translation being measured by the distance moved through by the centre of the body's mass in a given time, and the turning or rotation by the greatest angle contained between the positions of any one diameter of the body at the beginning and end of a given time. If there be a diameter which always remains parallel to its original direction, then that diameter is called the *axis of rotation* of the body, and is a *permanent* axis, but *not a fixed axis*, seeing that it has a motion of translation along with the body's centre.

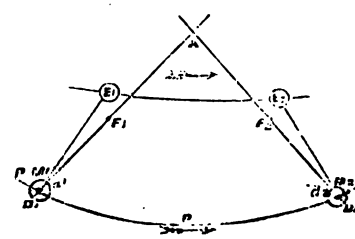
Fig 1.



To illustrate this, let B, B_2, fig. 1., be the positions at the beginning and end of a given portion of time, of a body of any figure whose centre of mass C moves in a path or orbit P P P P, either straight, curved, regular, or irregular, in the direction marked by the arrow T. Then the *translation* or *shifting* of the body in that time is the distance traversed by the centre of mass from C to C_2. Let a diameter of the body, perpendicular to the plane of the figure, remain parallel to its original position; this diameter is the permanent axis of rotation. Let D_1 d_1, D_2 d_2, be the positions, at the beginning and end of the given portion of time, of one and the same diameter of the body, in a plane perpendicular to the axis of rotation. Then the angle D_1 A D_2, made by those two positions of the same diameter, is the *rotation* or *turning* of the body in the given time. All this is a mere mental analysis of the body's motion.

To apply this to the case of the moon, let M_1, M_2, fig. 2, be two positions of the moon, at the beginning and end of a given time respectively, P P P being its orbit. It appears from observation that there is one diameter of the moon, and one only, which *remains always parallel to its original direction*. This, then, is called *the moon's axis*, and it is nearly perpendicular to the plane of its orbit. It further appears that there is

Fig. 2.



another diameter of the moon, at right angles to the axis, which is always directed to a point near the earth. Let E_1, E_2 be the positions of the earth corresponding to the positions, M_1, M_2, of the moon; F_1, F_2, the two corresponding positions of the point near the earth towards which the diameter of the moon in question is directed; D_2 d_2,

D_2 d_2, the two corresponding positions of that diameter. Produce the lines D_1 d_1 F_1, D_2 d_2 F_2, till they intersect in A; then is the angle, D_1 A D_2, the amount of *turning* or rotation of the moon during the given portion of time. It appears from observation that this angle is equal in equal times; that is, the rotation of the moon is uniform; and as the point, F, is always near the earth, the moon presents nearly, though not exactly, the same face towards the earth at all times; so that the uniform angular velocity of the moon's rotation is equal to the *average* value of the variable angular velocity of a line drawn from the centre of the earth to the centre of the moon. All this is a mere *analysis* of the observed motion of the moon into component parts, and is wholly irrespective of the *cause* of that motion.

In the second place, some of the objectors appear to attach to the word *rotation* something besides the simple meaning of *turning*, and to consider that it ought to be restricted to *turning round a fixed axis*. Were this limitation to be made, a new word would have to be introduced, to denote turning in general, with or without a fixed axis.

If the idea of a fixed axis be dismissed as non-essential, and the word *rotation* be understood to mean simply *turning*, then all the difficulty of admitting that each tooth of a cog-wheel rotates with the wheel, and that every object resting on the earth rotates with the earth, at once disappears; for if a rigid body turns as a whole, every one of its parts, how small soever, turns; and if any one of these parts, how small soever, turns, every other part turns, and the whole body turns, and every body rigidly connected with it turns, and all with the same angular velocity. It is true that there *can* be only *one fixed axis* of turning in such a body, or rigidly connected system of bodies, and there *may* be no such fixed axis; but each small part of such a body or system turns about an axis traversing its own centre, which axis, though not *fixed in position*, may be *permanent in direction*.

In fact, the essential property of a rigid body, by which it is distinguished from a flexible body, is the condition, that if any part of the rigid body turns, every part must turn at the same time, and with the same angular velocity.

To illustrate this, suppose one end of a cord to be held still, and the other end to be attached to a hook at the centre or fixed axis of a rotating wheel. The cord will undergo one twist for each turn of the wheel. Now transfer the hook to a point in one of the spokes, or one of the cogs, or to the end of an arm projecting from the wheel; the cord, whether its point of attachment be near to or far from the fixed axis, will still undergo one twist, neither more nor less, for each turn of the wheel, precisely as it did when attached to the centre.

For another illustration, consider that kind of panorama in which a picture painted on a hollow cylindrical surface remains at rest, while the platform in the middle, carrying the seats for the spectators, turns about so as to exhibit to them every part of the picture in succession. Every individual spectator, whatsoever the position of his seat on the platform, turns about with the platform, and turns about with the same angular velocity; and his axis of rotation, though not *fixed* unless he happens to sit in the centre of the platform, is *permanent in direction*, being always vertical.

I am, Sir, yours, &c.,

FIRINEACH.

August 13th, 1856.

CONSTRUCTION OF ARCHES.

To the Editor of the Mechanics' Magazine.

SIR,—In your number for the current week, a correspondent—"J. A. D."—gives the lines of key-stones for arches intended to resist the thrust or internal pressure of water passing beneath. I presume, of course, that it is intended to apply to arches of bridges, watercourses, culverts, &c., built with stone; and if "J. A. D." will be kind enough to give some instructions for setting the key-stones, I have no doubt it will complete the usefulness suggested to your readers.

I am, Sir, yours, &c.,

F. P.

August 15, 1856.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

MURDOCH, J. *Improvements in machines or apparatus for working chain-stitch embroidery.* (A communication.) Dated Dec. 21, 1855. (No. 2894.)

This invention consists of five principal parts—1. A needle carrying the thread. 2. An apparatus to strain the thread. 3. A hook to draw the thread. 4. A pusher to open the loop formed by the thread. 5. A hook to stop off the thread when each configuration of design is finished. These in their turn receive motion from a main driving shaft filled with cams. The motions of these cams are combined with a Jacquard apparatus, or machine for embroidering on the stuff in every direction, and consequently for executing any kind of pattern or design.

TYER, E. *Improvements in telegraphing or communicating by means of electricity.* Dated Dec. 21, 1855. (No. 2895.)

In this invention a soft iron needle is acted upon by an electro-magnet rendered magnetic by the passage of the line-current only to give a signal, and then it moves towards one or other pole of a permanent horse-shoe magnet. The invention also consists in arranging commutators or pole changers, in such manner as to direct the outgoing current through one instrument or indicator, and the incoming current through another, by causing the incoming current to pass along a spring which bears on a metallic point, from which the spring is raised. When the commutator is acted on thus, one instrument is thrown out of circuit, whilst the current is passed by the commutator through the other. The invention also relates to improvements in communicating between the parts of a railway train, and consists in so arranging magneto-electric machines as to cause them to be worked by the motion of the train.

FRANCIS, H. *Improvements in apparatus for cutting out parts of garments.* Dated Dec. 21, 1855. (No. 2896.)

In this invention, which is designed to facilitate the cutting out of several thicknesses, and therefore of several parts at once, an upright cutter is employed, having its cutting edge at the lower end. This cutter moves freely between guides, and is simply pressed down by the workman by a hand lever or handle to which the cutter is attached.

GLOVER, C. *Removing snow from a line of railways.* Dated Dec. 21, 1855. (No. 2897.)

This invention was described fully at page 106 of No. 1721 for August 2nd.

CURTIS, W. J. *Improvements in fog-signals, and in laying the same upon the rails of railways.* Dated Dec. 21, 1855. (No. 2898.)

This invention consists in attaching fog-signals to the rails by means of springs; also in laying fog-signals on to the rails by means of apparatus attached to a railway train.

GEDGE. J. *Improvements in cutting and folding paper to form letters or notes and envelopes in one piece.* (A communication.) Dated Dec. 22, 1855. (No. 2899.)

This is an improvement which enables the inventor to use the entire sheet of paper, and yet (the envelope being of one piece with it) to preserve the postal mark as additional evidence of the date of transmission of the letter.

KENNEDY, M., and T. EASTWOOD. *Improvements in pump buckets, which improvements are also applicable to lift-pumps, air-pumps, and all similar apparatus.* Dated Dec. 22, 1855. (No. 2900.)

This invention consists in employing an expanding ring clack, which, by its friction against the bore of the barrel, is raised from its seating when applied to a lift-pump as the spears and bucket descend, thereby allowing liquid to pass through to the barrel of the pump, and also caused to press against its seating when the spears and bucket rise. The ring clack consists either of expanding rings, in conjunction with one that does not expand, or of one expanding ring only.

NEWMAN, J., and W. WHITTLE. *Improvements in the manufacture of hooks and eyes, and in machinery to be employed in the manufacture of the hooks aforesaid.* Dated Dec. 22, 1855. (No. 2901.)

This invention consists—1. In manufacturing hooks and eyes from wire made by coating iron or other wire with brass or other metal. 2. Of machinery for manufacturing hooks, so constructed that the working parts are easy of access, and that the workman can readily change and adjust the various tools and working parts thereof.

JOHNSON, J. H. *Improvements in furnaces for steam boilers and other heating purposes.* (A communication.) Dated Dec. 22, 1855. (No. 2902.)

These improvements consist in making several divisions in the furnace, so as to form grates or fire-places separated from each other by low walls, with the view of making the unconsumed smoke and gases to pass from one division or grate over the incandescent fuel into the other divisions or grates. This subdivided furnace is placed at a considerable distance below the apparatus to be heated.

STEVENSON, W., and W. CRAWFORD. *Improvements in machinery or apparatus for carding or preparing fibrous materials.* Dated Dec. 22, 1855. (No. 2903.)

The wool or cotton passes through the machine in the usual manner as far as the main carding cylinder, but instead of doffing or removing the fibrous sliver as at present practised, a disc card is employed for this purpose. This disc is covered with wire card teeth, and set upon a vertical rotating spindle, so that the card face of the disc works with a part of its area against or in contact with the wire card teeth on the horizontal main cylinder. The surface motions of the main cylinder and the disc card are thus at right angles with each other, and as the main cylinder revolves, the disc card strips and carries away the wool or cotton from the main cylinder. The fibrous material is stripped off the disc card by clipping combs, and passed forward to a duplex endless apron arrangement, having a continuous forward traverse, and also a lateral vibrating action horizontally for the purpose of giving a rubbing rolling action to the fibrous material to complete the sliver or roving.

DRESSER, C. *Improvements in the mode of effecting what is called "Nature Printing."* Dated Dec. 22, 1855. (No. 2904.)]

By this invention the patentee can produce a true fac-simile of a leaf, flower, &c., on paper, cloth, &c., by using the leaf, flower, &c., as a printing surface, and printing with it on a lithographic stone or metallic plate or cylinder, and, after subjecting them to the usual processes for rendering them fit for printing, taking impressions in the usual ways.

ROWCLIFFE, E. *Improvements in the manufacture of blocks or slabs for paving or building purposes.* Dated Dec. 22, 1855. (No. 2906.)

The inventor takes natural asphalte and reduces it into small particles, and then places it in metallic or other moulds, without reducing it into a fluid state, and by hydraulic or other pressure makes it into the form required.

DICK, D. *A new and improved regulator for gas.* Dated Dec. 22, 1855. (No. 2908.)

This invention consists in the adaptation of a small quantity of mercury or other liquid moving with the apparatus, and so closing and opening the end of the inlet pipe as to regulate the supply in accordance with the demand at one uniform pressure.

CHESTERMAN, J. *An improved spring, especially applicable to the joints of knives, razors, scissors, and other like articles.* Dated Dec. 22, 1855. (No. 2909.)

This invention was described and illustrated at page 106 of our Number for August 2 (No. 1721).

HOLDWAY, F. *Improvements in carriages and various parts of the same.* Dated Dec. 24, 1855. (No. 2910.)

This invention consists — 1. In fixing springs of greater length than usual, and extending them from the back of the carriage to the front. 2. In combining two double elliptic springs together so as to form a single spring. 3. In shutting and letting down the steps of carriages by the action of opening and shutting the door. 4. In isolating the ends of the blinds of carriages, and preventing the rattling noise caused by the pin at the end of the blind shaking in the metal sockets or bearings, by lining them with soft material. 5. In certain reflectors for carriage lamps.

COWBURN, T., and G. W. MUIR. *Improvements in steam boilers, and in valves and parts connected therewith.* Dated Dec. 24, 1855. (No. 2912.)

These improvements relate—1. To forming steam boilers with vertical passages uniting the outer shell and external flue with the internal flues, the latter being formed of cells or chambers separated from each other by water partitions, having openings by tubes or flues for the passage of the products of combustion through them. 2. To the application of bladed or fan shafts, either hollow or solid, placed under the internal flues, and passing through the whole or part of the boiler, which, when set in motion, cause the water in the lower parts to pass toward the upper parts of the boiler. 3. To forming the supply pumps to the boiler with a hollow ram, permitting the passage of water into and through them, the valves of the pumps being segments of a sphere, with the weight placed below the surfaces in contact. The pump is in connection with a column of water in an air vessel, through which the exhaust steam may be passed. 4. To forming the float wheel water indicator for indicating the height of water in the boiler, with an equilibrium valve connected by a sliding tube with a float in the boiler. 5. To forming the glass water guages with adjustable parts, so as to suit various lengths of glass tube. 6. To constructing the feed and overflow valves to the boiler, with a float attached to the feed valve, and applying the overflow in a chest capable of being placed on the summit of a stand feed pipe. 7. To the construction of the stop valves with spherical surfaces, having spindles, applying pressure at a point below the seating, the spindle passing through a nut secured into the valve. 8. To forming the valves for the discharge of mud from boilers of a ram shape, the foot being convex; the side of the ram closing one opening, and the convex foot another. 9. To forming a fusible plug cap, the bottom of which screws on to the sides. The cup is fixed over a hole upon the top of the flue in an inverted position. The bottom is perforated with holes filled with lead or other fusible substance. 10. To constructing the safety valve to boilers of a convex form, and with a hollow spindle passing clear through. The spindle is carried into the boiler and connected to a swivel valve actuated by a lever and float.

SYMONS, W. *Improvements in the suspension roasting-jack.* Dated Dec. 24, 1855. (No. 2913.)

In this invention, instead of the pinion to which the meat is hung working in connection with the ground and crown wheels, as in the old suspension jack, the patentee has an additional pinion working with the ground wheel only, and carrying the meat.

BARTON, J. *Improvements in shuttles or shuttle tongues.* Dated Dec. 24, 1855. (No. 2916.)

The inventor so makes and fits the tongue or peg of the shuttle that the elastic force on the interior of the cop or bobbin is exerted only when the peg is in the position for weaving.

BROOMAN, R. A. *Improvements in treating beetroot and other saccharine vegetable substances, in order to extract alcohol therefrom, and at the same time render or leave the remaining parts of the vegetable fit food for cattle.* (A communication.) Dated Dec. 24, 1855. (No. 2917.)

This invention was described at page 32 of our Number for July 26, (No. 1726), as Leplay's distilling apparatus.

TOLHAUSEN, A. *Certain improvements in railway axle-boxes.* (A communication.) Dated Dec. 26, 1855. (No. 2918.)

These improvements consist—1. In place of having a flange cast to the front and upper edge of the axle-box, and projecting down, for holding the wedge and bearing to their places, the patentee makes an opening in the top of the box, through which he drops a loose lug down into the box, and against the wedge and bearing. 2. For excluding dust from the axle-box, and preventing loss of oil, the axle-box is provided with a flange cast around the opening through which the axle enters, and is furnished with a stuffing-box screwed on the inside of the flange: rings of leather are then cut to fit the axle, and placed between the stuffing-box and the axle-box. 3. For preventing the collection of oil on the back collar of the axle, the patentee attaches to the inside of the axle-box a semicircular spring, the ends of which project up nearly to the horizontal diameter of the collar, and spring hard against it, which scrapes and strips the oil from the collar when in motion, and conducts it back into the box. 4. He provides the lubricating roller with a number of recesses under the felt for retaining oil, so that if an accident should occasion the loss of oil from the box, the recesses would contain sufficient to soak through the felt to lubricate the axle. 5. For adjusting the lubricating oller to the axle in the course of its wearing, the frame in which the roller works is provided with a cylindrical screw, which forces the roller up against the axle by means of a spiral spring. Yet the spring is sufficiently yielding to give, should an accident occur with the pinion in the end of the axle, or gear wheel on the end of the roller, thus preventing breakage, or otherwise deranging. 6. In a mode of furnishing the lubricating material freely and with certainty to the journals of railway axles.

TOLHAUSEN, A. *Certain improvements in double-acting pumps.* (A communication.) Dated Dec. 26, 1855. (No. 2919.)

This invention relates to double-acting pumps in which two pistons are employed in the same cylinder, and consists—1. In working the two pistons by means of two *cranks or* eccentrics, geared together *between the two pistons.* 2. In giving one of the two pistons the "lead" of the other.

HILLS, F. C. *Improvements in economizing fuel.* Dated Dec. 26, 1855. (No. 2921.)

These improvements consist in the employment of steam mixed with atmospheric air, preferably heated, for supporting combustion, and in certain arrangements of furnaces for that purpose.

SAWYER, S. *An improved bomb-shell.* Dated Dec. 26. 1855. (No. 2922.)

Claims.—1. Combining with the but or flat rear end of a cylindro-conical iron shell, a layer of lead or soft metal, and united or not to a layer of such metal extended around the sides of the shell. 2. Making the rear part of the shell tapering or conical, and combining therewith a ring of lead, or its equivalent, also confining the explosive screw cap to the body of the shell, by means of a softer and yielding metal or casing, which, when the shell or cap shall strike an object, shall give way under the force of the blow, and let the cap down with force upon the percussion wafer or priming on the main screw stopping or plug, and so as to create an explosion thereof.

DUPPA, T. D. *Improvements in generating and heating steam.* (A communication.) Dated December 26, 1855. (No. 2923.)

These improvements consist in the employment of boilers with tubes or flues placed vertically, and in such a manner that the flame and heated air, after having passed through the tubes, may circulate around the steam chamber so as to effectually dry, and in a certain degree surcharge the steam. This is effected by forming a chamber with the boiler bodies, into which chamber the base of the chimney descends. Around the base of the chimney is a steam reservoir, which receives the steam from an upper and distinct reservoir, disposed around the upper portion of the chimney, and is intended to purge and separate the steam from the priming water.

MCCALLUM, D. *Improvements in electric telegraphs.* Dated Dec. 26, 1855. (No. 2924.)

This invention consists in employing mechanism acted on by electric currents, in such manner that separate symbols of different colours, or otherwise of different significations, may be separated and accumulated in succession, and according to settled codes, so as not only to telegraph by such symbols, but also for a time to record the communications. It is preferred to employ light and small spheres of different colours.

MAY, C., and E. A. COWPER. *Improvements in combing wool and other fibrous substances, and in machinery for that purpose.* Dated Dec. 26, 1855. (No. 2925.)

This invention mainly consists in constructing machinery for combing wool and

other fibrous substances by the combination of lashing apparatus and a working comb or combs, and drawing-off rollers, with a travelling receiving comb, so constructed that the fibrous substance, when being drawn off, is released from some or all of the teeth into which it has been lashed, and which hold it while being combed, and is drawn off through a portion only of such teeth, or through other teeth than those into which it has been lashed.

COWPER, E. A. *Improvements in combing wool and other fibrous substances, and in machinery for that purpose.* Dated Dec. 27, 1855. (No. 2927.)

A machine with a series of taking combs is mounted on a revolving cylinder or wheel, and as it revolves the combs become filled with wool from feeding apparatus, on passing it once or several times, taking a little each time. The wool is carried past working combs or card surfaces, by which it is cleaned, and it is then removed or doffed off the taking combs by combs which move sufficiently quick to overtake the taking combs.

KRUPP, A. *Certain improvements in guns and gun-carriages.* Dated Dec. 27, 1855. (No. 2928.)

Claims. — 1. Obviating the destructive action of gunpowder when discharged upon the vents or touch-holes of steel or other metal guns and ordnance by means of an improved vent or touch-hole described, that is to say, by fixing vents of copper, platina, or other similar metal, or alloys of metal. 2. The adaptation to the carriages of guns and ordnance of vulcanized India-rubber or other suitable elastic or metal springs, for the purpose of resisting or lessening the recoil. 3. Certain methods of adapting such springs to the carriages.

DOUGLASS, N. *Improvements in the construction of lighthouses, beacons, piers, and other similar erections.* Dated Dec. 27, 1855. (No. 2929.)

This invention refers to a mode of employing metal cylindrical piles, peculiarly constructed, for the foundations of marine and other like structures, which cylinders, being hollow, are floated by means of a novel arrangement of pontoons, carrying several cylindrical piles in position; it applies also to giving increased strength to iron lighthouses and like erections by adopting the form of fluted corrugations.

COOK, J. E. *An improved composition for preserving exposed surfaces or surfaces liable to deterioration and decay.* Dated Dec. 27, 1855. (No. 2931.)

In making up this composition, from two to six pounds of gum shellac are dissolved in every gallon of methylated spirit; or, instead of methylated spirit, wood spirit may be used.

GRIST, J. *Improvements in machinery for the manufacture of staves and parts of casks, and for forming them into casks, barrels, and other like vessels.* Dated Dec. 27, 1855. (No. 2932.)

This invention was fully described and illustrated in our number for August 9 and 16, Nos. 1722 and 1723.

ROBINSON, J., R. CUNLIFFE, and J. A. COLLET. *Improvements in locomotive steam engines, and in springs for locomotive steam engines and other purposes.* Dated Dec. 28, 1855. (No. 2934.)

This invention consists—1. In dispensing with the slide bars and slide blocks usually employed to preserve the parallelism of the piston rod, and in causing the piston rod to work in fixed bearings. 2. In an arrangement of pumps for supplying the water to the boiler, consisting of a pump worked by a small engine attached to any convenient part of the locomotive, and of a pump worked by one of the valve eccentrics, which is capable of being connected to the eccentric when required. 3. In constructing the clacks of the ball valves of pumps of the same piece as the seating, or the body of the pump or clack valve, and in regulating the lift of the ball valve by the lid. 4. In an improved mode of applying a steam chamber in the smoke box, for superheating or drying the steam. 5. In making the stays or stay bars of the roof of the inner fire box of rolled iron or bent plate iron, somewhat similar in shape to some of the rails used on railways. 6. In constructing springs for locomotive engines and other purposes of concave steel discs, with a hole in the centre, and radiating openings extending from the centre hole towards the circumference.

UTTLEY, T. F. *Improvements in the mode of applying fusible plugs to steam boilers.* Dated Dec. 28, 1855. (No. 2936.)

This invention is described at page 176 of this Number.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

DEVAUX, A. C. L. *Improved machinery for crushing and grinding vegetable and other substances.* Dated Dec. 20, 1855. (No. 2885.)

The inventor proposes to mount a live stone on a horizontal shaft, and face up one or both sides thereof as grinding surfaces. To one side, or to the two opposite sides, of this stone he applies a stationary burr stone, or its equivalent, and the side stones he so arranges with respect to the middle stone that suitable space shall be left between them for the passage of the corn or other material from the feed cups to the grinding surfaces. The space contracts so as to ensure the complete grinding of the material.

MERRITT, T. E. *Improvements in breech-loading ordnance and fire-arms.* Dated Dec. 21, 1855. (No. 2890.)

This invention, so far as relates to the breeches of ordnance, consists in the employment of a conical plug or faucet, fitted to turn transversely to the bore or axis of the gun, an opening being made through the faucet to coincide with the bore; within the breech is open, the bore extending entirely through the gun. The faucet is turned to open or close the breech by means of a lever handle, and is kept tight in its seat by a suitable tightening screw. When the charge is inserted, an india-rubber, lead, or copper valve is placed behind it, and on the back of this valve is formed a small handle or projection, over which a slotted portion of the faucet passes when the breech is closed. The object of this valve is to form, by its expansion, when the charge is fired, a perfectly tight breech. The portion of the invention relating to the breeches of breech-loading small arms consists, according to one modification, in the employment of a hinged breech piece or plate, jointed to the upper edge of a ring, which is brazed on to the end of the barrel. To this hinged breech piece is connected the tail of the valve before referred to, so that on opening the breech the valve is withdrawn ready for the introduction of a cartridge, and when the breech is closed, its valve is pushed into the end of the barrel immediately behind the cartridge; a strong bolt, worked by a handle on the side of the arm, serves to secure or release the hinged breech piece as required. The projectiles are of various forms.

ATKINS, I., M. GATE, and M. MILLER. *Improvements in apparatus for measuring and regulating the flow of gas.* Dated Dec. 22, 1855. (No. 2905.)

The inventor describes certain means of maintaining, by self-acting apparatus, the uniform level of the water in the water chambers of gas-meters, and of apparatus for regulating the flow of gas. The water chamber communicates with another chamber above containing water, by means of a pipe having a stop-cock; this pipe passes from below the level of the water line in the water chamber into the lower part of the reservoir, and there is another pipe, one end of which passes from just below the water line in the water chamber into the upper part of the reservoir, and there is a waste pipe in the water chamber, as usual. When the water line in the water chamber falls below its proper level, the mouth of the pipe leading to the top of the reservoir will be left unsealed, and the gas will pass up into the reservoir, and water will be allowed to *flow from the reservoir into* the water chamber *by the other connecting pipe*, and will again seal up the pipe which communicates with the upper part of the reservoir.

ZAHN, W. H. *Improvements in windmills or wind engines.* Dated Dec. 22, 1855. (No. 2907.)

This invention consists in making windmills or engines self-regulating, by causing the velocity of the wind to act upon the wings or sails which are attached to moveable or rotating spindles, so that they shall present only that surface to the wind which is required to produce an uniform speed, according to the power necessary.

GILLET-OUDIN, S. M. *Improvements in making bread.* Dated Dec. 24, 1855. (No. 2911.)

The mixture of dough and water is effected in a kneading-trough of galvanized sheet-iron of a prismatic shape. The dough is then placed on a metallic filter, when a stamper forces the dough to sift, and thus to mix and unite thoroughly. The dough thus sifted is taken to a cylindrical recipient forming the reservoir of a water-bath. The water surrounding this reservoir is heated by an internal fire; the effect of the fire is to augment the volume and produce of the dough, which is then mixed with other kneaded by the usual processes, and the whole is baked together.

OFFHAUS, C. E. *Improvements in rotary steam engines.* Dated December 24, 1855. (No. 2914.)

The main feature of this invention consists in the employment of a circular block upon a main shaft, so fitted that the pistons bury themselves in this block when they pass the steam stop.

LEAN, G., and R. THOMSON. *Improvements in weaving.* Dated December 24, 1855. (No. 2915.)

This invention relates to the application to power looms of self-acting apparatus for acting on the shed movements of the loom in such manner as to produce plain weaving and twilling alternately, according to any predetermined pattern.

LEWIS, J. W. *An improved picker for looms.* Dated Dec. 26, 1855. (No. 2920.)

The inventor makes the pickers of any suitable metal, with a slot for a piece of leather thong or other suitable material to fit into. He drills a hole through both the metal and material, so that instead of the point of the shuttle striking against the picker, it enters the hole, by which the force is borne by the shoulder instead of the point.

PETIT, S. *A new or improved apparatus for buoying ships or vessels, and also drawing them out of water.* Dated Dec. 27, 1855. (No. 2926.)

The inventor uses around the vessel a certain number of buoys of the form of prisms or pyramids, whose fronts are formed

by frames covered by tar cloth, which may be folded up when out of use. A number of these buoys put into communication with pumps by flexible pipes, having been sunk near the vessel, and fastened to her, the exhausting process takes place, and by the buoyancy of the buoys the vessel is raised.

LADMORE, E. *A new or improved method of securing ramrods to military fire-arms.* Dated Dec. 27, 1855. (No. 2930.)

The inventor fixes ramrods in place by means of a stud on the barrel which takes into a groove round the ramrod.

ROBERT, J. J. *The fabrication of torrified beetroot to supersede chicory as used in coffee, and with a great superiority.* Dated Dec. 28, 1855. (No. 2933.)

The inventor cuts beetroot into pieces about the size of a grain of coffee. He then cooks it gently in a circular oven in a closely shut vase, and when it is nearly done he adds fine oil, or good fresh butter, to hinder the evaporation of the sweetness and aroma. When roasted he grinds it like coffee, and it is then ready for sale.

PRESTON, F. *Improvements in the construction of military small-arms.* Dated Dec. 28, 1855. (No. 2935.)

This invention consists in so constructing the ramrod that it can be firmly supported in position, by means of a shoulder or groove acting against the band or nose-piece, and in constructing the band so as to cut or remove the end of the cartridge, to obviate the necessity of biting the same. The end of the cartridge is placed between the swivel of the band and the body of the band, and thereby held tight, whilst the same can be easily torn or cut off.

SALOMON, P. M. *Improvements in the manufacture of gas from peat, and in the coke resulting therefrom, and also in the apparatus connected with that manufacture.* Dated Dec. 28, 1855. (No. 2937.)

This invention consists in subjecting the gas after distillation from the raw material to the action of peat coke placed in a second retort and kept in a heated state.

ROWETT, W. *An improved mechanical arrangement for lifting weights and other useful purposes.* Dated Dec. 28, 1855. (No. 2939.)

This invention consists in the use of a vertical lever, weighted at its lower end, and having its fulcrum on suitable bearings, at or near its upper end. This lever has a pendulous motion given to it, and the power applied is given out at the upper end by the axle upon which it swings, or by the short upper arm of the lever!

TURNER, J. P. *A new or improved method of shanking metallic buttons, applicable to the heading of nails and other like purposes.* (A communication.) Dated Dec. 28, 1855. (No. 2941.)

The inventor cuts out the blank in the ordinary manner, excepting that the cutting tools form a depression in the centre. The blank is then subjected to the action of a stamp by which that depression is deepened, by the metal of the blank being pressed towards the centre, and raised into an annular form around the depression; the shank is inserted in the depression, and the partially formed button is again subjected to the action of a stamp. The metal near the centre of the button is thus closed upon the shank, and the latter firmly attached to the button.

PROVISIONAL PROTECTIONS.

Dated July 18, 1856.

1691. Etienne Mehrel, of Paris, France, carpenter. Improvements in hand planes.

Dated July 23, 1856.

1740. Samuel Frederic Berthier, of Red Lion-street, Borough, Surrey. An improvement in engines to be worked by a new elastic fluid in substitution of steam generated out of water.

Dated July 28, 1856.

1784. John Coplin, of Falmouth, Cornwall, merchant. Improvements in ships' windlasses.

1785. George Ritchie, of Ponsonby-street, Pimlico. Improvements in the manufacture of boots and shoes from materials not hitherto used for that purpose.

1786. Henry Robinson, of Settle, York, coal agent. Improvements in arrangements and mechanism for the conveyance or transport of loads or weights.

1788. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. An improved instrument for taking altitudes. A communication.

Dated July 29, 1856.

1790. Peter Joel Livsey, of Manchester, Lancaster. Improvements in arrangements and mechanism for rotating and retaining the rollers of window blinds.

1794. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Certain improvements in the process of generating illuminating gas. A communication.

1796. George Davies, of Serle-street, Lincoln's-inn, Middlesex, civil engineer. An improved portable apparatus for copying letters and other manuscripts. A communication.

Dated July 30, 1856.

1798. Felix Caron, of Great Titchfield-street, Middlesex. Improvements in fastening the handles of door locks and door finger plates.

1800. Henri Evette, manufacturer, of Lizieux, French Empire. Improvements in looms for weaving.

Dated July 31, 1856.

1804. Joseph Hopwood, of Bolton-le-Moors, Lancaster, millwright. Improvements in machinery for measuring and folding fabrics.

1805. George Holcroft, of Manchester, Lancaster, consulting engineer, and Peter Johnson, of Wigan, cotton spinner. Improvements in the

manufacture of cement, and in the application of a known material to cementing purposes.

1806. John James Kerr, of Twickenham, Middlesex, lieutenant in the royal navy. Improvements in the manufacture of cartridges for fire-arms.

1807. Constantine John Baptist Torassa, of Genoa. Improvements in obtaining motive power by the aid of explosive gases.

1808. John Evans, of Castleton, Monkton, Pembroke, annuitant. A progressive lever, by which is obtained an increase of power over the amount of power applied.

1809. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. A new musical instrument to be played by the agency of steam or highly compressed air. A communication.

1810. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. A new or improved process for obtaining aluminium. A communication from Messrs. Rousseau Frères and Paul Morin, of Paris.

1811. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. An improvement in the construction of carriages and wagons. A communication.

1812. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. An improved augur or boring tool. A communication.

1813. Pierre Marie Joseph Chamblant, of Rue de Lanery, Paris. Improvements in the manufacture of glass.

1814. William Coltman, of Leicester, wine merchant. Improvements in knitting machinery.

1815. Thomas Wicksteed, of Coleman-street, London, civil engineer. Improvements in separating sewage and other matters from water or fluid mixed therewith.

1816. Thomas Routledge, of Gracechurch-street. Improvements in the manufacture of half stuff and paper.

Dated August 1, 1856.

1817. William Paton, of Springvale, Glasgow, Lanark, N.B., engineer. Improvements in railway wheels.

1818. Alexandre Tolhausen, of Duke-street, Adelphi, London, Middlesex. A new and improved flexible pocket-umbrella, being likewise applicable to common and other sticks, canes, &c. A communication from L. A. Mangin, Paris.

1819. John Watkins Brett, of Hanover-square, Middlesex, gentleman. Improvements in letter and numeral printing electric telegraphs.

1820. William Wood, of Monkhill, near Pontefract, York, gentleman, and Matthew Smith, of Heywood, Lancaster, manufacturer. Improvements in looms for weaving terry and cut pile fabrics.

1821. William Wood, of Monkhill, near Pontefract, York, gentleman, and Matthew Smith, of Heywood, Lancaster, manufacturer. Improvements in apparatus for cutting the wires out of terry fabrics.

1823. Eugene Perré Chevalier, of Brussels, Belgium, gentleman. Improvements in the manufacture of cigars.

1824. Richard Albert Tilghman, of Philadelphia, U.S., chemist. Improvements in hydro-extractors or centrifugal machines.

1825. Robert Reeves, of Bratton Westbury, Wilts, agricultural implement maker. Improvements in machinery for sowing or depositing seeds and manure.

Dated August 2, 1856.

1827. Oliver Long, of Cornhill, London, commission agent. Improvements in mechanical knife-cleaners.

1829. Thomas Donkin, of Bermondsey, Surrey, engineer. Improvements in the glazing of paper. A communication.

1831. Thomas Green, of Leeds, mowing machine maker. Improvements in mowing machinery.

Dated August 4, 1856.

1834. Nicolas Cadiad, of Rue de l'Odéon, Paris, civil engineer. The application of centrifugal force for purifying liquids.

1836. George Walker, of Belfast, Antrim, spinner, and James Scrimgeour, of the same place, machinist. Improvements in spinning frames.

1838. Alexander Wright, of Millbank-street, Westminster, engineer. Improvements in lighting mines and subterranean places with gas.

Dated August 5, 1856.

1840. Henry Walker Wood, of Briton Ferry, Glamorganshire, gentleman. Further improvements in the manufacture of fuel, and for a new mode of preserving coal and coke and other fuel.

1842. Charles Fréderic Vasserot, of the firm Wells and Vasserot, of Essex-street, Strand, London. Improvements in machinery for cutting nuts, screws, and pieces of polygonal shape. A communication from N. Marchal and A. Oger, of Epernay, France.

1844. Antoine Dominique Sisco, of Paris, France, practical engineer. Improvements in railway brakes.

1846. Jean Jacques Danduran, civil engineer, Charlotte-street, Fitzroy-square, Middlesex. An apparatus called the self swimmer.

1848. John Keith, of Eltham, Kent, gentleman. Improved machinery for making envelopes. A communication.

1850. Augustus Pfaltz, of Massachusetts, U.S. A new and useful mode or process for making soap from rosin.

Dated August 6, 1856.

1852. Alfred Mitchell, of Liverpool, Lancaster, commercial agent. Improvements in apparatus for exhibiting and distributing advertisements, and for like purposes.

1856. Thomas Evans, junior, of Belmont-terrace, Lewisham-road, Kent. Improvements in harness.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

1854. John Yuil Borland, of Manchester, Lancaster, machinist. Improvements in machinery for preparing and spinning fibrous materials. Dated 6th August, 1856.

1868. John Woodman, of Manchester, Lancaster, engineer. An improved telegraph insulator. Dated 8th August, 1856.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," August 19th,* 1856.)

813. P. E. Chappuis. Improvements in looking-glasses to render them double-reflective.

837. J. Smith and J. Luntley. Treating the sunflower plant to render its fibres applicable to the manufacture of textile fabrics, paper, yarn, cordage, &c.

838. J. Leigh. The use or application of a certain substance or substances in the sizing, stiffening, or otherwise preparing cotton, linen, or other yarns and woven fabrics.

848. S. J. Gold. An improvement in apparatus for warming buildings by steam.

852. W. J. Curtis. Improvements in lubricating the axles of locomotive engines and of carriages on railways.

853. J. A. Ransome and G. A Biddell. Im-

provements in the manufacture of railway-bars and flanch bearers of railway crossings.

856. J. R. Whitgreave. Improvements in the arrangement and construction of locomotive engines.

867. T. W. Makin and J. Barnsley. Improvements in machinery or apparatus for embossing moiré antique water on all kinds of woven fabrics.

870. P. A. Fontainemoreau. An improved apparatus for measuring the speed of currents of air and water. A communication.

872. R. Davis. Improvements in the construction of tobacco-pipe stems.

879. R. B. Lindsay. An improvement in removing the scale or deposit from tubular flues of steam boilers.

883. J. Symonds and T. M. Fell. Certain improvements in the reduction of gold, silver, and other ores.

888. J. Barrans. Improvements in constructing steam engines.

891. S. C. Lister. Improvements in weaving.

895. H. P. Forbes. Improvements in breech loading fire-arms and ordnance, and in projectiles used therewith.

896. W. H. Olley. Taking photographic impressions or pictures of microscopic objects by reflection, such reflection being effected by the combined aid of the microscope and camera obscura and camera lucida or other reflectors that may be employed in place of the latter.

906. D. B. White. An improvement or improvements in cylinder pistons or plungers.

909. W. E. Newton. Improved apparatus for raising sunken vessels and increasing the buoyancy of floating vessels. A communication.

911. W. Armitage. An improvement in the manufacture of iron.

913. W. Wilkinson. Improvements in steam engines.

920. J. S. Wright. Improvements in the construction and ornamentation of belt or band fastenings.

970. G. Forster. Certain improvements in the arrangement of "trap-doors" or "air doors" and their cases, in the workings or passages in mines, whereby the efficient ventilation is maintained, which said improvements are also applicable in other similar situations.

981. A. D. Schratz. Improvements in preparing colours for the impression of woven or textile fabrics or stuffs of any kind.

992. G. Elliot and W. W. Pattinson. Improvements in the production of peroxide of manganese.

993. J. Hardacre. Improvements in the arrangement and construction of carriages and carriage-wheels.

994. C. Swift and J. J. Derham. Improvements in steam-engines.

995. I. D. Fraétaniel. An improved safety rein or bridle.

1002. W. E. Newton. Improved machinery for manufacturing painted or enamelled cloth. A communication.

1075. R. Royds. An improvement or improvements in the manufacture of soap.

1104. F. R. Laurence. An improvement in the manufacture of shirt collars and wristbands.

1291. R. Jobson. Improvements in apparatus for making moulds for casting metals.

1357. A. V. Newton. An improved furnace for heating soldering irons. A communication.

1392. P. Unwin and J. Unwin. Improvements in the manufacture of pen and pocket knives.

1530. S. J. Goode. Improvements in gas stoves, and the application of the same to the ventilation of buildings.

1591. G. Sampson. Improvements in finishing fabrics.

1594. J. Horsfall. An improvement or improvements in the manufacture of wire rope.

1632. P. Prince. Improvements in making moulds for casting railway chairs and other articles.

1698. W. McMaster and J. McMaster. An improved apparatus for retaining and releasing cords of window blinds, or cords, bands, or chains employed for other purposes.

1759. G. A. Copeland. An improved safety blasting cartridge for the use of miners and quarrymen.

1770. T. Wrigley. Certain improvements in machinery or apparatus for cleaning "cotton waste" or other materials used in the manufacture of paper.

1775. I. Baggs. Improvements in apparatus for lighting, signalling, and telegraphing by means of electricity.

1781. S. Yeadon and G. Chapman. Improvements in the construction of reeds for weaving, and in machinery or implements and materials to be used in such construction.

1788. W. E. Newton. An improved instrument for taking altitudes. A communication.

1820. W. Wood and M. Smith. Improvements in looms for weaving terry and cut pile fabrics.

1821. W. Wood and M. Smith. Improvements in apparatus for cutting the wires out of terry fabrics.

1826. W. F. Shaw. An improved burner or apparatus for the combustion of air and inflammable gas.

1840. H. W. Wood. Further improvements in the manufacture of fuel, and for a new mode of preserving coal, coke, and other fuel.

1854. J. Y. Borland. Improvements in machinery for preparing and spinning fibrous materials.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1853.

1903. John Henry Johnson.
1906. Hesketh Hughes.
1914. Edward Finch and Charles Lamport.
1921. John Heritage.
1923. Felix Alexandre Victor Delarbre.
1924. Thomas Clarke Ogden and William Gibson.
1927. George Leedham Fuller.
1955. Frederick Osbourn.
1961. William Rettie.
2039. Gage Stickney.
2040. Gage Stickney.
2104. John Wright Child and Robert Wilson.

LIST OF SEALED PATENTS.

Sealed August 12, 1856.

1856.

467. Robert Baker Jones.
491. John Cornes.
493. Francis Thompson.
557. Samuel Last.
569. Richard Archibald Brooman.
579. Robert Hannah.
819 George Tomlinson Bousfield.
1087. Alexander Charles Louis Devaux.
1099. William Basford.
1267. William Edward Newton.

1275. George Bell and George Charles Grimes.
1337. James Combe.
1427. Arthur George Baylis.
1483. John Henry Johnson.

Sealed August 15, 1856.

403. Hyam Jacob Hyams.
407. Henry Hodgkinson.
413. Sylvester Emil Sichel.
414. Frederick Austin Spalding Witter.
415. William Henry Bowers.
440. Isaac Moll.
442. Jacques Henri Marie Maissiat.
462. James Edward Boyd.
466. Thomas Goode Messenger.
480. Charles Frederick Claus.
482. Chares Damas Auguste Joseph Planque.
490. James Steedman.
492. Philipp Schäfer and Frederick Schäfer.
506. Francis Prime Walker.
520. John Graham.
616. Charles Durand Gardissal.
660. John Bishop Hall.
682. Gustav Georg Anton Ludwig Michael Schelhorn.
764. Charles Durand Gardissal.
962. William Smith.
1082. Jonathan Amory.
1086. William Edward Newton.
1144. William Horatio Harfield.
1190. Richard Maxwell.
1306. James Edward McConnell.
1400. Constant Jouffroy Duméry.

Sealed August 19, 1856.

424. Richard Laming.
426. William Muir.
428. William Lynn.
438. John Barsham.
448. William Clarke.
452. John Sharp Cromartie Heywood and George Lloyd.
454. John Kingsford Field and Charles Humfrey.
613. James Murdoch.
617. Charles Durand Gardissal.
739. Constant Jouffroy Duméry.
1313. Thomas William Willett.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

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LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, *Dublin*; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1725.] SATURDAY, AUGUST 30, 1856. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

FRANCIS'S METALLIC BOATS.

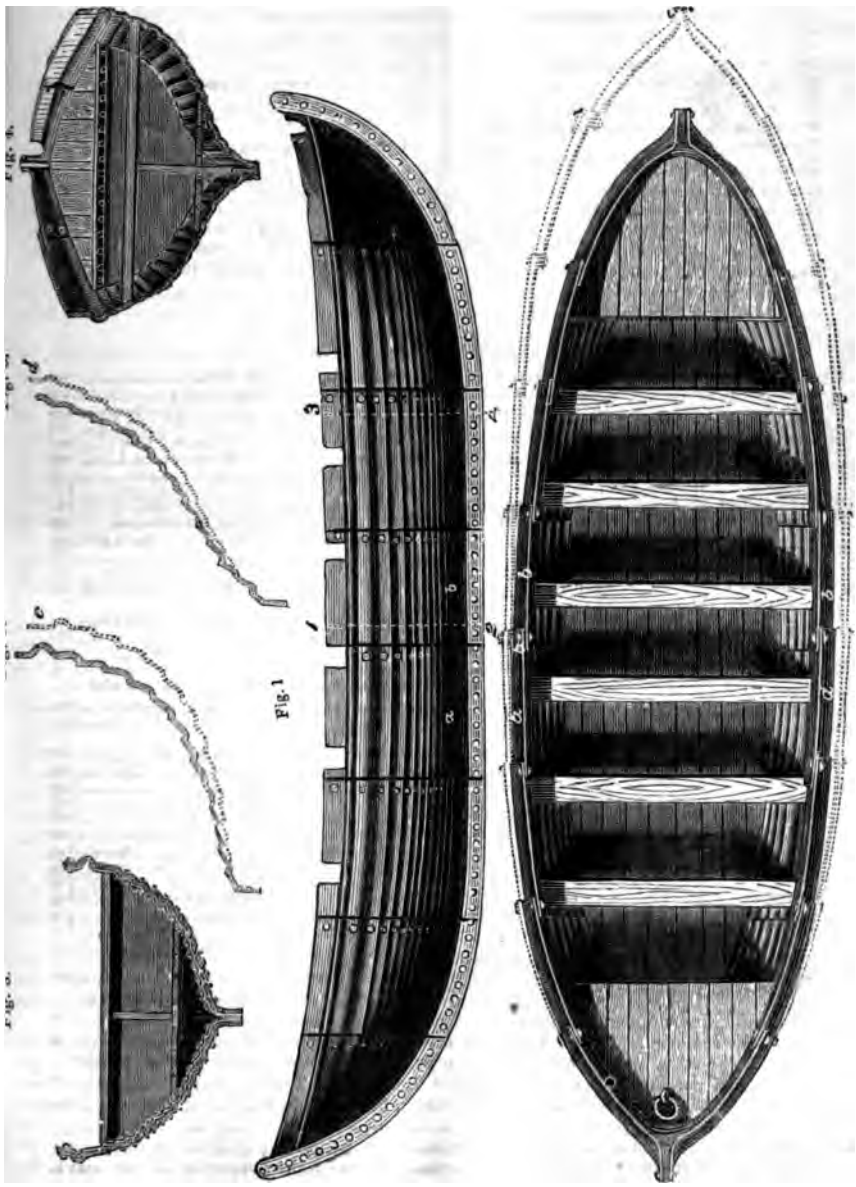

Fig. 1

Fig. 2.

FRANCIS'S METALLIC BOATS.

At page 408 of our number for 17th May last (vol. lxiv., No. 1710), we directed the attention of our readers to a very important invention, consisting of a method of stamping out metallic boats by means of dies, the boats so produced possessing extraordinary qualities. We now publish on the preceding page engravings illustrative of the invention, and propose to supply such further information respecting it as may be useful and interesting.

From a paper read before the British Association, at Cheltenham, by Major Vincent Eyre, F.R.G.S., Bengal Artillery, who has taken a very energetic and honourable part in forwarding the introduction of the improved boats into this country, we learn the following facts:—"For thirty-five years of his life Mr. Francis has been engaged in the occupation of boat-building, and has, perhaps, devoted more earnest and intelligent consideration to the improvement and perfection of that beautiful art, and with greater success, than any other man on the face of the globe. For about a quarter of a century his labours were confined, not without excellent results, to boats of wood, till at length he commenced a course of experiments with metal, which led to the conception and eventual completion of that admirable method which it is my present object to place on record before the members of this learned Association. It may be well to mention, *in limine*, that very heavy expense has attended the perfection of the machinery and manufacture of the inventions."

The first public intimation of Mr. Francis's invention that was given in this country, was contained in the application for a patent on his behalf in 1845 (by Mr. Detmold), by which he proposed to manufacture boats from sheets of corrugated metal.

In the specification of that patent he proposed to employ a half round corrugation, to give rigidity to the sheets of metal which formed the sides of the boat, and also to take up the surplus metal at the parts of the sheet where a contracted surface was required to conform to the curved lines at the head and stern; but this shape of corrugation, running in one unbroken line from head to stern, although imparting great strength to the boat, rendered its manufacture too costly for practical purposes, inasmuch as for every sized boat a separate set of dies was required. To remedy this defect, he has subsequently so modified the form of the corrugation as to admit of a sheet of corrugated metal being bent to any required sectional figure, to suit boats of different breadths and models without deducting materially from the resisting strength of the corrugations; and to provide for varying the length and breadth of boats, he forms the sides of sheets of metal, set breadthwise along the keel, and jointed together by lap joints running parallel, or nearly parallel with each other from the gunwale to the keel.

In the engravings on the preceding page fig. 1 shows, in side elevation, a metal boat constructed on this principle; fig. 2 is a plan view of the same; fig. 3 is a cross section, taken through the middle of the boat at the line 1, 2, of fig. 1; and fig. 4 is a cross section, taken through the line 3, 4, of the same fig., and showing the bulkhead of the air-chamber in elevation. The boat, it will be seen, is composed of plates or sheets of corrugated metal, of different forms, examples of which are given in figs. 5 and 6. These plates are brought to shape by pressure between fixed and stationary dies, the moving dies being forced upwards against the fixed dies by means of hydraulic or other pressure. The breadth of the corrugations may vary; but Mr. Francis has found by experiments that corrugations about four inches broad will answer the best. At those parts, where increased or unequal contraction or expansion of the plate is required to prevent buckling, the depth of the corrugations must be gradually increased or decreased, as the case may be. The variations of depth found to answer are from five-eighths to three-fourths of an inch. It should be remarked that, in order to impart great rigidity to thin sheets of metal by corrugating the same, it is desirable to approach in the sectional form of the corrugation as near to a right angle as the metal will permit without fracture.

The plates, prepared as above indicated, are connected together and to the keel by rivets, as shown in the several views of the boat, lapping the edges of the several plates over the adjoining plates, whereby a stiff shell is formed, having joints of about two and a half inches in breadth, and requiring no braces or angle iron to keep it in shape.

It now remains to explain how boats of various sizes may be constructed by the use of one and the same set of dies. To construct the boat represented at figs. 1 and 2, eight breadths of corrugated plates are supposed to be required to complete its length. Now, supposing these plates each to measure three feet in breadth, and that it is required to form a boat three feet longer than that shown in the engraving, this may be readily effected by applying an additional pair of plates between the plates *a* and *b* on the opposite sides of the boat; and if it be desired at the same time to enlarge the proportion of the boat at the *bows and sides*, the plates of metal may be bent outwards to the dotted positions *c* and *d* of *figs. 5 and 6, the form of* the corrugation being such as will admit of this bending back of

the plate without rupturing the metal even when metal of only ordinary quality is used; the boat will then assume the proportions indicated by the dotted lines, fig. 2. The opposite effect, that is, the construction of a boat of smaller dimensions than that for which the set of dies was prepared, may be obtained by diminishing the number of the plates, and by bending inwards those used, and increasing the width of the lap joints. By these means the width of the bows of the boat may be contracted, as desired, and increased strength may be imparted thereto. If, then, a medium size of boat be chosen as a model for the corrugating and shaping dies, a great variety of proportions of boats may be built from plates or sheets of metal prepared from such dies, and thus the cost of manufacture will be sufficiently reduced to bring the invention into profitable and general use.

In our former article we mentioned that the Emperor Napoleon, after due investigation, had approved Mr. Francis's invention, and ordered the establishment of a factory both for boats and waggons on the principle. The following further extracts from Major Eyre's paper will complete the knowledge of our readers in all that relates to the subject.

"I have now said all that seems necessary regarding the metallic boat. I will next hasten to describe the other inventions, of which the models are now before you, as briefly as possible. Here is a strange-looking affair, called the 'Life Preserving Car,' and most justly may it be so styled, for it has probably saved more lives than any other invention yet known. It is, you see, of metal, in form somewhat like a boat, but differing from a boat in being closed over by a convex deck, having a hatchway in the middle whereby the passengers are admitted to the dark but welcome 'fireside of hope' within. On the occasion of a vessel being stranded, a communication is effected with the shore by means of the well-known mortars and apparatus, first invented by Captain Manby. The car is then suspended on a hawser, and hauled by the crew from the shore to the ship, whence, after receiving its living freight, it is drawn back to land by the people there assembled. This process is repeated until every person on board the wreck is in safety. At the wreck of the *Ayrshire*, on the coast of New Jersey, in the midst of a violent snow storm, every soul on board, comprising *two hundred and one*—men, women, children, and infants, were drawn through a terrific foaming surf 'dry and comfortable.' This is but one instance out of many, and for this one invention the name of Joseph Francis deserves to be held in universal honour as a benefactor to his race.

"It is devoutly to be hoped that our whole line of coast may be supplied with these admirable cars as soon as practicable. This is not a matter in which the country would be justified in sleeping.

"Having already occupied so much of your valuable time, I can only briefly draw your attention to the model of a metallic army waggon, and the accompanying drawings illustrative of the various uses to which it is applicable on service in the field, whether as a travelling communication, or commissariat store cart on land, or as a floating raft on water; or, by further combination, as a temporary bridge across a river, where no better means are at hand. This waggon has been twice tested at Woolwich, by Colonel Tulloch, who has recommended it strongly to Lord Panmure for adoption. The subject is now before the Select Artillery Committee.

"I am not singular in the belief that if introduced into our public service in India, this invention would prove of incalculable value. Sir George Pollock, Sir Frederic Abbott, Major-General Brooke, and other scientific Indian officers of established fame, have expressed a similar opinion.

"In conclusion, perhaps I cannot do better than quote another sentence from Colonel Portlock's address at the United Service Institution:—'In fact,' he said, 'there is so much of practical ingenuity in Mr. Francis's inventions, that he sincerely hoped that the British Government, however habitually cautious it might be in admitting great military changes, would follow the example at once of the government of the United States, and of Napoleon III., by adopting in the army and navy both the boats and the waggons of Mr. Francis;' to which I heartily respond an 'Amen,' with the addition of 'life cars' for our coasts. However that may be, it is certain that the governments of France, Belgium, and Russia have seriously directed their attention to the subject, and seem determined at no distant period to adopt these inventions in their naval and military systems. It is, therefore, high time for the British public to be up and stirring, that we be not left behind in the race of improvement."

ON THE MEASUREMENT OF SHIPS FOR TONNAGE.

BEING A REPORT TO THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, AUGUST, 1856, FROM A COMMITTEE APPOINTED AT THE MEETING IN GLASGOW, SEPTEMBER, 1855.

THE committee consisted of the following gentlemen :—Mr. Andrew Henderson, Mr. J. R. Napier, Mr. John Wood, Mr. Allan Gilmore, Mr. Charles Atherton, and Mr. James Peake.

As the first-named member of the Committee on Tonnage Measurement, it becomes my duty to report progress in the matters referred to us, and in so doing I beg to premise my report with the remark that I was induced to propose this committee from having had the honour of reading a paper on "Ocean Steamers, Clipper Ships, and their Descriptive Measurement," to the Association at their meeting at Liverpool (*Vide* page 152 to 156 of Report, 1854). While at Glasgow, in 1855, a new Shipping Bill having come into operation, I found the extreme interest then publicly taken in the general question of Government interference in shipping affairs seemed to render this committee expedient.

The serious and important character of the subject thereby involved, and the consequent responsibility imposed on all individuals who may take a prominent part in this matter, have operated as an obstacle to the immediate establishment and working operation of this committee. In the first place, I beg to notice that the subject of tonnage registration, as connected with our national statistics of shipping, had been brought to the notice of the public both at the Institution of Civil Engineers, by myself, in 1853, and at the Society of Arts by Mr. Charles Atherton, in a manner which has fully set forth the importance of the subject, and shown that legislative enactment will be necessary in order to correct the deficiencies of our present tonnage registration of shipping. The subject having been thus brought before the public in its most serious and important aspect, has apparently induced several of the gentlemen proposed for this committee to decline the task thus expected of them.

The absence from Glasgow of many interested in the subject rendering previous communication impracticable, the president and officers of the mechanical section, deeming it desirable that the three scientific bodies before whom the subject had been brought should participate in the investigation, Mr. John Scott Russell was nominated to represent the British Association ; and it *being also considered* expedient to follow the precedent of the Tonnage Committee of 1849, which comprised shipowners, shipbuilders, officers of the Royal Navy, merchant service, and Trinity House, gentlemen connected with Lloyd's Register, and their surveyors, with several naval architects and engineers, there were proposed, Mr. Allan Gilmore, Mr. John Wood, and Mr. James R. Napier, as representing the shipowners and shipbuilders of Scotland, Mr. C. Atherton, and Mr. J. Peake, naval architects and engineers, with the understanding that they were to seek the co-operation of others.

Accordingly, application was made to noblemen, officers, and engineers connected with the navy, the Society of Arts, and Institution of Civil Engineers, the shipowners' societies of London and Liverpool, the Committee of Lloyd's Register of Shipping, and to shipbuilders. Although many of these gentlemen of scientific attainments and practical experience offered to participate in the investigation, difficulty and delay occurred, from some of the members of the committee being resident in distant parts of the country, while for the deposit of papers and plans for reference by the committee no provision had been made, even in the metropolis ; the only means of bringing them under consideration was the forwarding copies of them to the principal ports, that the members might elicit the opinion of the local Marine Boards and shipowners.

With this view, application was made to the Board of Trade for copies of Acts and Parliamentary papers bearing on the question, to be submitted to the members of the Committee of the British Association in their investigation of tonnage measurement.

The official reply was that the Board of Trade "do not consider that the law of tonnage measurement requires alteration, or that the subject requires further investigation with any view of amending the law." "Most of the papers to which you refer are published, and can be purchased. Those which have not been published, and which are among the records of this office, my lords cannot part with, but you are at liberty to inspect and take copies of the plans which you have yourself submitted to the Board."

In addition to these delays and the difficulties thrown in the way by the routine of a public office, Mr. Allan Gilmore and Mr. John Wood, of Glasgow, expressed a desire to withdraw from the committee, and Mr. Scott Russell's engagements, especially in connection with the construction of the great ship for the Eastern Steam Navigation Company, has so engrossed his time and attention as to have put it out of his power to take that interest in this question which has hitherto so laudably characterized his

exertions in the cause of science, in connection with the labours of the British Association.

Mr. Atherton also declined, on the ground that the public agitation of the question referred to, in which during the past year he was engaged before the Society of Arts, disqualified him for the time being from taking part on this committee; consequently, Mr. James R. Napier and Mr. James Peake were the only parties available for co-operation with myself (Mr. Henderson) in this matter, and it has, therefore, been considered most advisable, under the circumstances above referred to, not to officiate in our collective capacity as a committee of the British Association, but simply to give our individual aid in promoting the discussions which have thus sprung up.

With this view, I have myself taken a personal interest in the discussion of the tonnage registration question before the Society of Arts, as exemplified by the documents submitted herewith, showing a large amount of statistical data on steamship performances, which has been collected by me since I originally brought it before the Institute of Civil Engineers in 1847, with the view of collecting in the archives of that Institution, statistics of the progress of improvement in our mercantile marine.

The papers comprise my view as to tonnage measurement, as laid before the Board of Trade in 1850 and in 1852, and as to steam navigation and the speed realized by mail steamers as laid before Parliament in 1851, papers read before the Institution of Civil Engineers in 1853, the British Association in 1854, and published by the Society of Arts in 1855; together with the discussions that have taken place in the *Journal* of that Society, in 1856, on Mr. Atherton's paper on "Tonnage Registration." The system of measurement I proposed to the Board of Trade in 1850, was exemplified by a *pro formâ* certificate of survey, appended to the paper, as well as by a tabular analysis of the proportion and displacement of different ships and modes of measurement, and including the paper read before the Association last year, and subsequent information, as well as proposed new rules, will be printed complete, before submitting them to the consideration of any Committee or authority that will investigate the whole question.

Mr. James R. Napier has, I understand, during the past twelve months, collected much statistical information on the trial performances of steam ships, and Mr. Peake has taken the opportunity of drawing public attention to the question of the mode of measurement most available for shipping operations: by these means I beg to bring to the notice of the general committee, that the individual labours of Mr. Atherton, Mr. Napier, Mr. Peake, and myself have now contributed materially to the elucidation of the subject referred to, thereby facilitating any further effort that may be decided on. The favourable manner in which Mr. Atherton's paper on the analogous subject of "Mercantile Steam Transport Economy" has been received at the mechanical section of the Association, affords every prospect of the labours of this committee being now prosecuted under far more encouraging prospects of public support and co-operation, on the part of the shipping interests themselves, than has hitherto been the case.

As an example of the benefit to be derived from public discussion, I may refer to the numbers of that popular work, the *Mechanics' Magazine*, published during the months of April, May, and June last, in which, after fully investigating the subject of the deficiencies of our present tonnage registration for scientific purposes, the editor has been pleased to announce the following admitted deficiencies and proposed corrections of our present system for the consideration of its numerous readers:

First,—"That the tonnage, measurement, and registration of vessels has never been brought before government in any other than a purely fiscal point of view."

Secondly,—"That government in legislating on tonnage registration has not contemplated the scientific features of the case, nor those which bear on the sea voyage."

Thirdly,—"That undoubtedly there is a point beyond which ships cannot be safely loaded."

Fourthly,—"That undoubtedly it would be desirable, if possible, to fix a limit to the degree to which ships may be loaded."

Fifthly,—"That as respects the draft of water at which ships leave port, let the Board of Trade have, if it so pleases, properly authorised officers to note and record the facts."

Sixthly,—"We would see with satisfaction a competent committee appointed by Government, or by the British Association, with a view of ultimately, if need be, acting on the Government, to take into consideration the foregoing points."

Such being the declaration of opinions expressed by editor of the *Mechanics' Magazine*, one of our most popular periodicals devoted to science, in respect to the deficiencies of our present system of statistical registration of tonnage, it is respectfully submitted that good and sufficient cause is

shown for the re-appointment and further continued labours of the committee on this subject, and that under such indications of the public appreciation of the utility of such labours, there can be no doubt of such amendments of the present system being obtained as will conduce to public good.

It may be in the recollection of members that at the meeting of the British Association at Liverpool, in 1854, the recommendations of the General Committee included one, "That it was expedient for the advancement of naval architecture, that a portion of the intended museum at Liverpool should be appropriated to this subject." Little progress having been yet made with the museum at that port, while the want of such an establishment for the record and disposal of papers and models, added to the difficulties of the committee of 1855, it is with satisfaction I have to state that such difficulties may be considered removed for the future, by the considerate offer of the chairman of the Crystal Palace Company, Mr. Arthur Anderson, to lend the naval gallery of the Palace in any manner that can aid the objects of the committee, or ventilate the subject.

Considering that there are already collected at the Crystal Palace naval gallery, models of ships and steamers, fishing-boats and life-boats, both English and foreign, ancient and modern, a comparison can be there made of the rapid improvement in shipping and steam vessels since the old tonnage law was abandoned, the great desideratum being that on the six points enumerated, the question shall be better understood, and facilities afforded for investigation and the re-examination of our system of measurement and registration. The vast advantages that would thereby accrue to our mercantile marine, will, it is to be hoped, induce every effort to be made by the British Association.

ANDREW HENDERSON.

Cheltenham, August 8, 1856.

Subsequently, at the General Meeting of the Association, held August 13, 1856, the committee, mentioned at page 170 of our last Number, was appointed.

ON MERCANTILE STEAM TRANSPORT ECONOMY.

BY CHARLES ATHERTON, ESQ., CHIEF ENGINEER OF HER MAJESTY'S DOCKYARD, WOOLWICH.

(*Concluded from p.* 175.)

Having already defined the measurement of the units by which we propose to designate the working power of the engines and *the size of the ship*, namely, ind. h. p. at 33,000 lbs. raised 1 foot high per minute, and tons weight of displacement at 35 cubic feet of water to the ton, it is now necessary that we refer to the received law or formula by which the comparative dynamic duty of steam-ships may be numerically ascertained. The formula usually adopted for obtaining the coefficient of dynamic duty of steam-ships is

$$\left(\frac{V^3 D^{\frac{2}{3}}}{\text{Ind. h.p.}} = C\right)$$

in which D is the displacement of the ship at the time of trial expressed in tons weight, V the speed (usually expressed in nautical miles per hour) and ind. h. p., the working power as ascertained by means of the indicator. The resultant number C deduced from this formula is termed the coefficient of dynamic performance. This coefficient C will be a constant number for all vessels of perfectly similar model or type of form, and of which the engines are equally effective in proportion to their gross ind. h. p.; but if the vessels be not of similar type, and the engines not equally effective in proportion to their ind. h. p., the coefficient C will vary, and thus the dynamic performance of different vessels will be *comparatively* classified. It is not our purpose in this paper to raise any question as to the scientific rationale or resultant accuracy of this formula; I will merely observe, that though open to criticism in several respects, the results of experience have demonstrated that this formula, when applied to any known type of ship, expounds the mutual relations of displacement, power, and speed, with a degree of precision that admits of its being practically made use of for determining the resultant speed that is to be expected from any combination of power and displacement, and, in like manner, any one of the three elements of the formula may be deduced from the other two being given. Further, this formula may be rendered available as a counting-house check on the working operation of steam-ships, simply by substituting the consumption of coals, expressed in cwts. per day of 24 hours (W), in lieu of the ind. h. p.; for 1 cwt., or 112 lbs., per day of 24 hours, is at the rate of 4·66 lbs. per hour, which is probably about the ordinary consumption per ind. h. p. per hour, and it ought not to be exceeded. If, therefore, in lieu of the ind. h. p. we substitute the consumption of coals, calculated in cwts. per day of 24 hours, the resultant coefficient (C) will afford an approximate indication of the good or bad performance of ships, as compared one with another; and the fact of an inferior performance being thus detected, the cause to which it may be attributable, whether to inferior type of form, or foulness

of bottom, or inferior adaptation of engine, or inferior construction of boiler, or inferior management on board ship, will then become the subject of professional inquiry. Thus the merchant, by aid of his counting-house statistics of displacement, time on passage of given length, and coals consumed, will be enabled to detect the fact of inefficiency, and it will then be for the professional engineer to detect and remedy the cause thereof. The annunciation of the formula, or the mercantile rule above referred to, is as follows:—Multiply the cube of the speed, expressed in knots or nautical miles per hour (V^3), by the cube root of the square of the displacement ($D^{\frac{2}{3}}$), and divide by the consumption of coals, expressed in cwts. per day of 24 hours, the resultant numeral coefficient (C) will indicate the dynamic or locomotive efficiency of the vessel; and, such is the variable condition of steam-ships in present use, that the coefficient has been found to be as low in some cases as 120, whilst in other cases it has reached the number 250. The pecuniary value of gold is determined by assay; and, in like manner, the contract price to be paid for a steam-ship should, in some measure, be regulated by the coefficient, based on the mutual relation of displacement, speed, and coals, which may be realized on trial of the ship: for example, multiply the contract price by the numeral coefficient that may be actually realized, and divide by the coefficient that may be regarded as the *par* measure of dynamic efficiency, according as the vessels may be painted or sheathed with copper. Contracts based on this principle would constitute a check upon the production of inefficient ships, and award a premium on the construction of ships of superior merit.

The approximate trustworthiness of the formula

$$\left(\frac{V^3\ D^{\frac{2}{3}}}{\text{Ind. h.p.}} = C\right)$$

being conceded, we now have the means of pursuing our exposition of the extent to which any definite difference of type or falling off in the working condition of a ship will affect the amount of prime cost expenses incurred in the conveyance of merchandize by steam-ships. Suppose, for example, that we have ships whose coefficients of dynamic duty or index numbers (C) deduced from the formula

$$\left(\frac{V^3\ D^{\frac{2}{3}}}{\text{Ind. h.p.}} = C\right)$$

are respectively 250 and 166, which numbers correspond with 1,000 and 664, if the unit of marine engine power be taken at 4 ind. h. p., as is the case in the tabular calculations *given in Atherton's "Steam-ship Capability,"* and are coefficients of dynamic duty not unusual as between different steam-ships in actual practice; in evidence of which, confirmatory of the official records whence these numbers are taken, I may refer to a tabular statement of steam-ship trials recently supplied to me by one of our most experienced firms (engineers and ship-builders), by which statement it appears that, adopting the formula referred to, the index numbers or coefficients of dynamic duty of eight steam-ships varied from 251 to 149, thus showing that the difference of constructive types now assumed as the base of calculation for this exposition, is not an exaggeration, but such as is common in practice. In the first place, referring to "Steam-ship Capability," 2nd edit., page 78, we will expose the difference of power (ind. h. p.) which would be required by two vessels, A and B, of the respective types or working conditions of service indicated by the coefficients above referred to (namely, 250 and 166), supposing the vessels to be each of 2,500 tons load displacement. The vessel A will be propelled at 8 knots, 10 knots, and 12 knots per hour, by 376 ind. h. p., 736 ind. h. p., and 1,272 ind. h. p.; but the vessel B will require to attain the same rate of speed, 568 ind. h. p., 1,112 ind. h. p., and 1,920 ind. h. p. Thus the ship B requires, in consequence of her inferiority of working condition, or type of construction, an increase of power of no less than 50 per cent. in order to attain the same rate of speed as ship A; and, be it observed, that these assumed coefficients are within the range of ordinary difference between one ship and another.

We will now show the sacrifice which such a difference of type produces in the weight of cargo which these ships of (say) 2,500 tons displacement, with mean quantity of coal on board, would respectively carry on a given passage, if powered for running at the speed of 8, 10, and 12 knots per hour. For this exposition we will assume the weight of the ships themselves, as measured by the light displacement of ships, when ready to receive cargo and coal for the voyage, to appropriate 1,000 tons displacement, being 40 per cent. of the load displacement. We will also assume the weight of the engine department complete at 5 cwts. per ind. h. p., and the consumption of coal to be at the rate of 4 lbs. per ind. h. p. per hour, and the length of passage, without re-coaling, to be 3,250 nautical miles, being about the distance from Liverpool to New York or to Constantinople. On these data, according as the vessels may be powered, as before shown, for being propelled at the speed of 8, 10, and 12 knots per hour, the displacement

available for cargo in A will be 1,270 tons, 1,103 tons, and 875 tons weight of cargo; while in B it will be 1,152, 900, and 556 tons weight. The consumption of coal in A will be 273 tons at 8 knots, 427 tons at 10 knots, and 615 tons at 12 knots; and in B it will be 412, 645, and 929 tons weight. Hence it appears that purely in consequence of the difference in constructive type, or working condition of the ships, the reduction of cargo in B, as compared with A, will be 9, 18, and 36 per cent., according as the speed may be, 8, 10, or 12 knots per hour; while the increase of coal, being in proportion to the increase of power, will, in each case, be 50 per cent. But the public evils of an inferior type, or neglected condition of ships, will be still more fully exposed, and be more definitely understood by the extra £ s. d. charge that must be made for freight per ton weight of goods conveyed, in order to meet the prime cost expense of conveyance. In order to work out this calculation, we must assume certain data of investment and current expense as constituting the prime cost charges of permanently establishing and upholding a commercial fleet of steam ships; and as this is the vital point in which the public, as consumers, have a direct interest, it will be expected that I enter upon it in considerable detail, as set forth in supplement to "Steam Ship Capability," 2nd edit., page 76.

In the first place, I would remark that it is only during the number of days that steamers are annually at sea, conveying cargoes of goods from port to port, that they earn the income that is to defray the whole annual expenditure incurred. The number of days per annum during which steamers are at sea will, of course, depend materially on the service in which they may be employed; and as it is proposed to work out our calculations with reference to a passage of 3,250 nautical miles—such, for example, as the passage from England to New York, or to the Black Sea—I have assumed that the vessels employed on such service may be at sea 200 days per annum. In the next place, the cost of coal is a very material item, greatly dependent on the service on which the vessels may be employed. This I have assumed at £2 per ton weight as the average cost of the yearly consumption. Next, as to the ship; I have assumed that a ship of 2,500 to 3,000 tons *load displacement* would be purchased from the builders as a ship of about the same amount of tonnage, builders' measurement, and that the cost of the ship, *completely fitted, equipped,* and furnished *in all respects ready for sea,* would be £25 *per ton. Then assuming* the interest on investment at £5 per cent. per annum, the upholding and replacement at 10 per cent. per annum, insurance at 5 per cent. per annum, and wages and rations of officers and crew all the year round at £3 per 100 tons per week. On these data we shall have the prime cost expenses incidental to the hull amounting to £6 11*s.* 2*d.* per ton of tonnage per annum, which is 8*d.* per day sea-time, assuming the vessel to be at sea 200 days per annum, exclusive of harbour dues, lights, and pilotage, which are supposed to be the same for all ships of equal tonnage.

Next, as to the engine department:

The average price of marine condensing engines, as now usually constructed, may be rated at £50 per nominal h. p., and in general each h. p. nominal may be expected to work up to 2½ ind. h. p., so that the cost of marine engines may be rated at £20 per ind. h. p. Then, assuming the interest on investment at 5 per cent. per annum on the contract cost, the upholding and replacement at 10 per cent., insurance 5 per cent., wages and rations of engineers and stokers at £5 per 100 ind. h. p. per week consumable stores (coal excepted) £2 10*s.* per 100 ind. h. p. per week, on these data we shall have the prime cost expenses incidental to the engine department (exclusive of coal), amounting to £7 18*s.* per. ind. h. p. per annum, which is 9d. per day per ind. h. p. sea-time, assuming the vessel to be at sea 200 days per annum.

These assumed data of pecuniary charges incidental to steam ship transport service, as applied to mercantile purposes, combined with the mutual relations of displacement, power, and speed, which are derivable from the foregoing formula $\left(\frac{V^3 \; D^{\frac{2}{3}}}{\text{Ind. h. p.}} = C\right)$ according to the constructive type or locomotive quality of the ship, as shown by the coefficient or index number, C, enable us to make up the prime cost expenses, being the minimum at which goods can be conveyed, and which, therefore, should constitute the base of the estimate by which a minimum scale of freight charges should be estimated; and applying these data to the ships, A and B, employed on a passage of 3,250 nautical miles, as exemplified in the supplement to "Atherton's Steam Ship Capability," 2nd edition, page 78, the minimum scale of freight charges per ton of goods, according as the vessel may be powered for a speed of 8, 10, or 12 knots per hour, will, on the data referred to, require to be as follows:

	8 knots.			10 knots.			12 knots.		
	£	s.	d.	£	s.	d.	£	s.	d.
Ship A..	1	15	7	2	4	6	3	4	6
Ship B..	2	7	2	3	9	8	6	16	3

The proportions in which goods, according to their respective kinds, may be made to bear freight charges so as to yield the average return per ton weight on the entire cargo, is altogether a matter of commercial discretion and management. The entire cargo must be made to yield the average return per ton weight here set forth.

Hence it appears that 12 miles speed involves about double the freight cost of the 8 miles speed with the superior ship A, and nearly three times the cost of the 8 miles speed with the ship B, and 12 miles speed with the ship B is about four times as expensive as the 8 miles speed with the ship A. Also, the extra cost to the public at which freight charges are enhanced by the inferior type or inferior working condition of ship B, as compared with the ship A, if continuously employed on the passage of 3,250 nautical miles, and under the data referred to, assuming the consumption of coal to be at the rate of 4 lbs. per ind. h. p. per hour, and according as the steaming speed of both ships may be 8, 10, or 12 knots per hour, is no less than 32 per cent. at 8 knots, 56 per cent. at 10 knots, and 111 per cent. at 12 knots. Undoubtedly, the details of the data on which the foregoing calculations have been based are open to correction, and will greatly depend on their application to special services on considerations immediately connected with such special service, and cannot be generalised; but, whatever alteration of these data may be applied to the ship A must likewise be applied to B, so that, although the foregoing estimate of the actual cost expenses of freight may be considerably modified by our altering the data of the calculations, still, the per-centages of difference above set forth showing the *degree* or per-centage in which freight charges for the passage of 3,250 miles are enhanced in consequence of the inferiority in locomotive properties of the ship B, as compared with ship A, will not be much altered from the per-centages above set forth, showing an enhanced cost of freight to be paid by the public on bringing cargo, grain for instance, from the States, or from the Black Sea, to England, amounting to 32 per cent. at the 8 knots speed, 56 per cent. at the 10 knots speed, and 111 per cent. at the 12 knots speed, extra charges incurred on freight per ton of goods conveyed, and to be paid by the public, in consequence of the dynamic inferiority of ship B, as compared with ship A. It is surely in consequence of the public not being generally aware of the high scale of prime cost charges necessarily involved in a 12 miles speed (steaming speed at sea) as compared with an 8 miles speed, that such high speed is so universally demanded by the public, and it must surely be in consequence of an almost similar want of insight into the real cost of high speed on the part of directors that obligations as to speed are so frequently incurred at a price inadequate to such service. If the public will have a progressively increasing high rate of speed, they must pay for it about in the ratio at which they purchase iron, copper, silver, gold, and diamonds, either of which may be bought too dear for common use.

The foregoing results have been based on the supposition that the consumption of fuel in both ships is at the rate of 4 lbs. per hour per ind. h. p. My own experience, however, induces me to be of opinion that this rate of consumption is but very seldom realized, and that 5 lbs. of coals per ind. h. p. per hour is much nearer in accordance with our present actual steaming practice. It is, therefore, important that we show to what extent the rate of transport freight expenses will be enhanced if the service above referred to, namely, 3,250 nautical miles direct, be performed with an inferior construction of boiler, causing a consumption of 5 lbs. of coal per ind. h. p. per hour, instead of 4 lbs., as above calculated on. In this case, according as the speed for which the vessel may be powered is 8, 10, or 12 knots an hour (see "Steam Ship Capability," page 78), the cost expenses incurred by vessel A, instead of being £1 15*s.* 7*d.*, £2 4*s.* 6*d.*, and £3 4*s.* 6*d.* per ton weight of cargo, will now amount to £1 19*s.* 5*d.*, £2 11*s.* 4*d.*, and £3 19*s.* 1*d.* per ton weight of cargo, this increase of prime cost freight expenses per ton of goods being 11 per cent., 15 per cent., and 22 per cent., according as the service speed may be 8, 10, or 12 knots per hour, solely in consequence of the inferiority of the boiler or inferiority of boiler management, causing this extra consumption of fuel; and further, if this greater consumption of coal be combined with the inferior type of vessel B, the prime cost expenses of freight per ton of goods, instead of being £1 15*s.* 7*d.*, £2 4*s.* 6*d.*, and £3 4*s.* 6*d.*, will now be £2 13*s.* 7*d.*, £4 5*s.* 5*d.*, and £9 15*s.* 2*d.*, this increase of freight cost being 18*s.* per ton, £2 0*s.* 11*d.* per ton, and £6 10*s.* 8*d.* per ton weight of cargo conveyed, or 50 per cent., 100 per cent., and 202 per cent. extra charge incurred according as the service speed may 8, 10, or 12 knots per hour. These results show the monstrous extent, in a pecuniary point of view,

to which the public are interested in the general quality of the type of ships and machinery adaptation thereto, and working condition of ships by which the mercantile transport service of the country may be prosecuted. But let us look a little further into this matter, in the hope of obtaining a more definite appreciation of the total extent in £ s. d. to which the British public are interested in having their mercantile transport service performed to the best advantage. It has been publicly stated (*Times*, June 18th, 1856,) that at the twelve principal ports of the United Kingdom during the year 1855, ship tonnage to the extent of 6,372,301 tons entered inwards, and 6,426,566 tons cleared outwards, making altogether 12,798,867, say 12½ millions of tons of tonnage per annum; and since mercantile shipping will probably, *on the average*, carry dead weight of cargo to the full extent of their register tonnage, it is probable that the tons weight of merchandize constituting the cargoes of ships arriving at and sailing from the United Kingdom, amounts to no less than 12 millions of tons per annum, of which, for the purpose of illustration, we will suppose that one-sixth part, or two millions of tons, is conveyed by steam power on a passage of 3,250 nautical miles, under the circumstances of the data that have been assumed as the base of the foregoing calculations; and since we have shown under these circumstances that the prime cost expenses of freight per ton of goods may be enhanced by an inferior type of ship and machinery, or inferior management thereof, to the extent of 18*s.*, £2 0*s.* 11*d.*, and £6 10*s.* 8*d.* per ton weight of goods conveyed, it follows that the extra charges for freight on the assumed quantity of two millions of tons weight per annum, will amount to the extra annual cost or public loss of £1,800,000 at 8 knots speed, £4,916,666 at 10 knots speed, and £13,666,666 at 12 knots speed, according as the type of ship and machinery by which the work is performed may be of the inferior type, B, as compared with the superior type, A; seeing also that it is the public interest which has to bear the brunt of our national goods transport service, being either as respects construction or working condition anything short of that degree of perfection which the application of science might achieve, is it not, therefore, of importance, that our public system of statistical shipping registration should be complete, especially in those points which are essential for scrutinizing the dynamic properties of *steam-ships, thus leading* to the recognition *of good practice on the* one hand, or the exposition *of bad practice* and consequent public loss on the other? Ships may be regarded as national implements for doing the work of the nation, and should, therefore, be subjected, by the aid of statistical registration, to public scrutiny, as conducive to their being upheld fit to do their work in the best manner. A shipbuilder will not allow his interests to be trifled with by the use of a blunt adze; so the public interest requires that its national transport service in the conveyance of goods should not be performed by bad ships if the statistical grindstone will obviate the evil. Nevertheless, the public statistics of British shipping afford no data available to science for promoting or even protecting from abuse the great public interests which are involved in the proper execution of its transport service, amounting probably to 12 millions of tons per annum. It is pre-eminently for the British Association to suggest the remedy for this humiliating fact.

The subject herein treated of admits of extended illustration beyond the limits of time that I may presume to occupy at a meeting of the British Association. I only profess to have broken up new ground in showing that mercantile transport service by steam-ships admits of being brought within the range of arithmetical calculation, whereby the dynamic quality of ships, the size of ships as measured by displacement, the working quality of engines and engine-power as measured by the unit ind. h. p., and the speed to be assigned as the condition of any service, may each of them be treated as functions of calculation involving definite pecuniary considerations, constituting a system which may be denominated the "arithmetic of steam-ship adaptation to the requirements of mercantile service." By the application of these principles of calculation, I submit that errors in steam-ship construction, or neglect of its working condition, may be exposed, correction will follow, the directorial management of steam-shipping affairs, as respects steam-ship capability, will be based upon arithmetical calculation, thereby prosecuting its assigned service with confidence, and rejecting all Utopian projects that will not pay. Thus, science will produce its fruit in promoting public interests, without detriment to the fair competitive pursuits of any class, by producing a sound, well-understood, and healthy condition of steam-ship management, and consequently of "Mercantile Steam Transport Economy."

CHARLES ATHERTON.

THE MOON'S MOTION.

LETTERS upon the above subject have been received from Mr. Jelinger Symons, Mr. Evan Hopkins, and other gentlemen. We have not space for them this week, but will endeavour to insert them in our next—probably with a few comments of our own.

ON THE REASONS FOR DESCRIBING THE MOON'S MOTION AS A MOTION ABOUT HER AXIS.

BY THE REV. DR. WHEWELL.*

THE moon's motion may be described, in one way among others, by saying that in each month she revolves about the earth nearly in one plane, turning always the same face to the earth. But if a body were rigidly fastened to a rigid radius which revolved about the earth nearly in one plane, such a body would during that revolution turn always the same plane to the earth. Now, would such a body be described as revolving upon its axis during such a revolution? By many persons it would not be so described. But the moon is described by astronomers as revolving about her axis in the course of every month. What are the reasons for such a description? The reasons are briefly these:—1. The moon is not fastened to the earth rigidly, nor fastened at all. 2. The moon being thus detached, the reference of the moon to the earth as a centre of revolution is arbitrary. 3. The other celestial bodies which revolve about centres also revolve about their axes, and the rule regarding them as not revolving about their axes when they turn always the same face to the centre, would produce confusion; it would, for instance, compel me to say that the earth revolves upon her axis 365¼ times in a year, whereas with regard to the fixed stars she revolves 366¼ times. Also, when a body revolves about a centre turning always the same face to the centre, then is mechanical force required to make it so turn; but no mechanical force is required to make it remain parallel to itself while it revolves round a centre.

1. The moon is *not* fastened to the earth rigidly, as the ancients supposed when they invented the crystalline spheres as the mechanism by which the heavenly bodies revolve, and by which they are connected with one another; and as the body representing the moon is fastened to the body representing the earth in machines made by man. The moon in nature is entirely detached from the earth, and the fact of her turning the same face to the earth does not at all form the machinery of her monthly revolution. Hence it is ascribed to a separate motion, her monthly revolution on her axis.

2. The reference of the moon to the earth is *arbitrary*. The moon revolves about the earth, but she revolves about the sun also. She revolves about the sun *more* than about the earth; for when she is between the sun and the earth, her face is concave to the sun and convex to the earth's orbit. There are, in some respects, stronger reasons for regarding her as fastened to the sun than as fastened to the earth. But in truth she is not fastened at all; and the simplest way is to regard her as quite detached, and to consider her motion by which she turns her face different ways as quite separate from the motion by which she revolves about any centre.

3. The other celestial bodies also revolve about their axes, and especially the earth. All persons agree in thus expressing the fact in the case of the earth; and as there are 365 days in the year, the earth revolves 365 times on her axis with reference to the sun. By doing this she revolves 366 times on her axis with reference to the fixed stars.

4. It may easily be shown experimentally that mechanical force is requisite in order that a body revolving about another may always turn the same face to the other. The following is one way of doing this. Let a cup containing water be fastened at the extremity of an arm which revolves in a horizontal plane about a centre. The cup will, of course, always turn the same side to the centre, being forced to do so by the rigid connection of the parts. But the water in the cup, not having any rigid connection with the centre, will not turn the same side to the centre during the revolution of the cup. This will appear if a straw be made to float upon the surface of the water; for the straw will always point in the same direction with regard to surrounding objects, and not with regard to the centre. If the motion is very rapid or long continued, a slight deviation of the straw from its original position will be produced by the friction of the water against the sides of the cup.

* British Association, 1856.

MR. BESSEMER'S DISCOVERY.

BY C. SANDERSON, ESQ., OF SHEFFIELD.

THE metallurgical world has been paralyzed not only by the statements set forth at the meeting of the British Association, at Cheltenham, but by the details given in the *Times* of a trial made in London to exhibit Mr. Bessemer's process for producing malleable iron, fine steel, or any mixture of the two which might be required in the arts or by engineers, from crude iron.

The public is justified in receiving the statements made, because it seems impossible to doubt their accuracy. The invention is momentous, involving immense interests, both in the steel and iron trade. It has, like a meteor, shot across the beaten path of science, and dazzled us all by its apparent brilliancy. Having had some experience in the manufacture of both iron and steel, I propose to give the result of such experience, as well as my opinion of this novel mode of manufacture.

Mr. Bessemer runs crude fluid iron into a small cupola-formed vessel; about 7 cwt. of metal only has hitherto been operated upon, but he can as easily act upon 5 tons. A blast issuing through five tuyeres is driven into the metal at 8 lbs. or 10 lbs. pressure; and the effect obtained is, that the oxygen of the blast, uniting with the carbon, produces carbonic acid or carbonic oxide gas, which gives out a certain amount of heat. This operation goes on as long as there is carbon enough left to unite with the oxygen to produce the gas, and as the supply of carbon becomes reduced, so the ebullition of the metal, caused by the gas struggling to escape, becomes less active, and in the end entirely ceases.

When the agitation of the metal subsides, the contents must then be tapped out, or, it is said, if the iron be allowed to remain a little longer under the action of the blast, then a spongy mass of malleable iron is obtained.

The statement publicly made is that "In 30 minutes, by the foregoing process, Mr. Bessemer converts 7 cwts. of crude metal into ingots of malleable iron or steel of any size, and fit for the various manipulations ordinarily employed." He does away with puddling, hammering, rolling, and all the subsequent operations now in daily use at our iron works. He states that fine steel is produced for the engineer, and for general manufactures, and that iron so produced is equal to Swedish or Russian, now selling at from £20 to £30.

These form the leading features and pretensions of the new process, and if so desirable a result could be obtained, truly the invention would deservedly rank amongst the first, if not the very first, of the age.

I have very carefully examined those results which might be expected from an operation like the one before us, and I cannot agree with the statements made to the public by the inventor, or by those who have seen and supported both his theory and practice.

I freely admit that a *decarbonized cast iron* is obtained—that such iron is bright, white, *and crystalline;* but *I do not believe* that *such metal will admit of being* either *drawn under a hammer, or rolled to a bar.* I cannot admit such metal into the category of cast steel, for it cannot, in my opinion, fulfil its requirements; it will not make a boring tool, or a cutter—a tap, or a die; it cannot be fashioned by the workman's hammer, or made into a needle, or cut into a file; in fine, I am compelled to give an opinion that it is a metal which cannot assume the commercial value of steel.

At this moment, when Mr. Bessemer's process is receiving so much of the metallurgical world's attention, particularly from those whose high attainments are generally acknowledged, it may appear somewhat presumptuous to find one strong dissentient voice; yet, from the many and very careful experiments I have made, I cannot agree with a too commonly accepted opinion,—that presuming cast iron to contain 5 per cent. of carbon, and steel 1 per cent., if you deprive the crude iron of 4 per cent. of its carbon, it necessarily becomes steel. This is not the case. Mr. Bessemer's product is a decarbonized metal; the larger crystals are more decarbonized than the smaller ones, and a good lens will show that the mass is made up of small bright atoms, which are the particles least affected by the operation. The result is a metal not capable of being drawn under a hammer, or rolled to a bar; and whilst I venture to state that the process will not produce steel fit for any useful purpose, I must also add it will not produce a malleable iron suited to our wants.

I feel assured that my practical knowledge has not led me wrong in making these bold statements, which are so opposed to the generally conceived opinion. I trust they will be received in the spirit which has dictated them—not to undervalue Mr. Bessemer's exertions—but to thank him for his "mite" to that general stock of knowledge in the metallurgical art which has raised England to the elevated position she now enjoys.

Prize Essay on the Prevention of the Smoke-Nuisance. By CHARLES WYE WILLIAMS, Assoc. Inst. C.E. London: John Weale, 59, High Holborn. 1856.

(*Concluded from p.* 181.)

6th. Of the run or distance which should be provided for heated products to travel along. This department of the essay will, no doubt, receive due attention and criticism in consequence of its sweeping condemnation of the principle which may be said to characterize modern practice, viz.,

the multitubular system. This system Mr. Williams condemns with an unsparing hand, on the two-fold grounds—1st. That tubes, instead of being steam generators, as usually considered, act the mischievous part of refrigerators of the flame, which they at once convert into smoke, with all its evils of sooty deposit; 2nd. That they injuriously occupy the very portion of the boiler through which the heated products have to pass, and where the plate flue would be most effective in generating steam.

The essay here controverts a universally-received idea, and proceeds to show that the mere increase in the number, or in the aggregate *internal surface* of the tubes, is no compensation for the diminished shortness of the run, and time available for giving out heat to the water, which they occasion.

This subject of tubular boilers manifestly demands a more thorough investigation than it has hitherto received. In his work on the "Combustion of Coal," Mr. Williams deals more fully with it.

Many striking illustrations are given on the main point of the insufficiency of the area for the draught, and the direct, though unsuspected influence it has, both as regards the generation of steam and the formation of smoke; and the error of condemning either the mode of introducing the air, or the quantity required, because of any apparent failure in special cases is shown. One remarkable instance of this error in the furnaces and boilers of a large sugar refinery in Liverpool is given in detail, and is suggestive of much practical information. The essay quotes Mr. Muir's paper on this hasty condemnation without inquiry, and the mischief it does to truth and practical improvement. This is so important, that we give the quotation with Mr. Williams' running comment in brackets:

"To many," says Mr. Muir, "it appears to be a *very extraordinary thing*, that when smoke is burned less steam is raised in a given time. It seems sound reasoning to say smoke is fuel [very *unsound* rather], and since steam is raised by the burning of fuel, the burning of smoke should raise steam. This is so far correct [very incorrect truly]; but I have observed that in many cases where smoke [gas] is consumed by the admission of air *above*, and not *through* the fuel, there is *not so much coal consumed*; and since coal also is fuel, it is evident that the burning of the smoke may, by decreasing the consumption of coal, lessen the heat of the furnaces, and thereby reduce the quantity of water evaporated in a given time."

Mr. Williams observes, that to comment on such an attempt at reasoning is unnecessary, and then adds, "Now the really 'extraordinary thing' here is, that any inquirer, especially *one professing to have* examined the subject both 'practically and scientifically,' should have remained satisfied with the crude remark, that 'when smoke,' meaning gas, 'is burned, less steam is raised in a given time,' and yet make no effort to test the assumed fact, or ascertain the cause of what appeared so contradictory to common sense—a circumstance which seriously reflected on his own incompetence for such an inquiry."

The remainder of the 9th section is devoted to illustrations of many land and marine boilers, with the view of showing in what manner the air has been successfully introduced to furnaces of all descriptions during the last fifteen years. A remarkable feature in these applications is, their extreme simplicity and cheapness (which may be usefully contrasted with the many costly patented apparatuses which late years have produced.) Among the best may be mentioned one (No. 11 in the series of figures) in which the boilers, though of the ordinary construction otherwise, had its tubes so reduced in length, that their aggregate of heating surface was but 4·1, and that of the flue plates but 5·5, making a total heating surface of but 9·6 square feet per nominal horse-power; the usual allowance, in the tubular surface alone, being 20, instead of 4·1, as above. The details of this boiler, which is stated to be unexceptionable, both as a steam generator and smoke preventer, are given in contrast with the ordinary tubular boiler, and cannot fail to excite surprise. We have been informed that such is the success of this radical change in the area of the tubular surface, that it has produced a considerable influence with boiler makers.

Section 10 examines the legislative measures applied to the prevention of the smoke nuisance, and the cause of their failures. This section, involving the *preventive*, as well as *remedial* appliances, embraces a wide and important field of inquiry.

Mr. Williams strongly comments both on the terms and on the mischievous influence of the existing Metropolitan Act—the 16th and 17th Victoria, and which has been taken as the basis of the Liverpool Act for the suppression of the nuisance; observing, that as it has been based on an absolute misconception of the cause of the smoke nuisance, and the means of its prevention, so its remedial clauses are unwarranted, impracticable in their administration, and productive of much injustice when enforced. We fear these remarks admit of a more general application, at least where practical and scientific knowledge are called into requisition in the construction of Acts of Parliament.

In the case before us, the Act begins by insisting that every furnace shall be constructed so as "to burn the smoke arising from such furnace." The error, and even

absurdity of this announcement, is exposed by Mr. Williams, and the necessary confusion it produced in the adjudication of the police courts' magistrates is instanced.

As to the failure of attempts at enforcing legislative measures, many cases are adduced, all arising from the undefined nature both of the offence and the remedy; and, above all, from the penalties being leviable on unoffending parties.

On this head some striking illustrations are offered, with a direct reference to the only means of preventing the continuance of the evil, and for which the terms of an amended Act are suggested, the remedial clauses being placed in opposition to those which the existing Act contains.

As to the preventive or corrective measures, Mr. Williams separates — 1st. The case of existing furnaces (for the mal-construction of which the mere owners cannot justly be held responsible); and 2nd. Furnaces which may be constructed after the new Act shall be brought into operation.

Of the first, as it would be absolutely impossible to alter the construction of many boilers and furnaces (at least so as to allow combustion to be properly effected), where such impossibility is proved, on the evidence of competent engineers, penalties on the unoffending, and often ignorant owners, should not be inflicted. As to the cases of boilers or furnaces hereafter to be made, the proposed amended Act cannot fail in effecting the abatement of the nuisance. The remedy suggested is, the holding the engineer or maker responsible for the machines they execute. This is at once effected by enabling the owner of the offending furnace to recover, by a summary process, the amount of whatever penalties may be inflicted. Thus the operation of the Act would distinguish between a retrospective or *ex post facto* operation, which must ever bear the character of injustice, and a prospective abatement of the evil, operating, in fact, as "a practical measure of prevention, instead of a fruitless attempt at cure."

We cannot conclude our review without doing justice to the assiduity and labour which the essay exhibits, and by which much new matter and many new views are brought before both the practical and scientific engineer. However the class of practical engineers may dissent from the views taken by Mr. Williams, we anticipate no small good from their perusal of this essay, and trust that the author may live to see the fruit of his gratuitous labours in the practical and successful application of those principles of nature which he has so long and so thoroughly investigated.

We repeat the expression of our approval *of the system of prize competition* which *the Society of Arts has adopted*, and which gives a direct and praiseworthy object to the workings of intelligent and inquiring minds, which would otherwise want that stimulus for exertion which interest or occupation produces among men of business.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

CHISHOLM, G. *Improvements in the manufacture of artificial manure.* Dated Dec. 28, 1855. (No. 2938.)

The patentee makes use of leather, and submits it to the action of hydrochloric acid, in a gaseous form, and at an elevated temperature; when saturated with the acid he passes through the leather carbonate of ammonia in a state of vapour, and in a sufficient quantity to neutralize the acid; the leather then crumbles into powder.

BAILY, H. G. *Improvements in machinery for digging and forking land.* Dated Dec. 28, 1855. (No. 2940.)

The patentee constructs a machine to be worked by steam, in such manner that a series of spades or forks carried by a frame shall be caused to descend into the earth, and then each spade or fork shall act as a lever on its fulcrum to lift its clod, and then to turn on its handle or axis to cast the clod to the right or to the left.

HARROP, L., S. BARLOW, and A. BOYD. *Certain improvements in self-acting mules for spinning and doubling cotton and other fibrous materials.* Dated Dec. 29, 1855. (No. 2942.)

This invention consists in an improved combination of parts for effecting the winding of the yarn on to the spindles during the running in of the carriage.

REDFERN, H. *Improvements in skates.* Dated Dec. 29, 1855. (No. 2943.)

This invention consists in a method of so constructing skates, that no wood, straps, or buckles are required in making or fastening them.

LANGE, W. *Improvements in biscuit ovens.* (A communication.) Dated Dec. 29, 1855. (No. 2946.)

The patentee employs a number of small fire-places, the heat from which is conducted by tubes or pipes over or under the upper portion or web of an ordinary endless travelling wire cloth, carried by large drums at each extremity of the oven. The dough is laid on this cloth and traversed slowly through the oven between the heating pipes, and issues from the other end of the oven completely baked.

BROWN, W. *Improvements in cooking and culinary vessels and utensils, and in the application and conveyance of heat.* Dated Dec. 29, 1855. (No. 2947.)

This invention relates to the arrangement of vessels, utensils, chambers, pipes, &c., used for the application and conveyance of

heat, with an encircling air space, jacket, or division, for aiding the effect of the heat, and economizing its consumption.

BIRCH, G. R. *A form and folding desk combined, adapted for the use of schools.* Dated Dec. 29, 1855. (No. 2948.)

This invention consists in so constructing a form or seat as that the same may be used as a desk or table and form or seat combined, or as a form or seat only.

LEES, S. and E., and G. H. NEWTON. *Certain improvements in machinery for spinning and doubling cotton and other fibrous substances.* Dated Dec. 29, 1855. (No. 2949.)

These improvements apply to self-acting mules, &c., where copying motions are used, and consist in a new arrangement of the working parts. They comprise the use of a spindle and plates in the shaper or builder to alter the length of the chase of the cop, and a plate so fixed on the shaper as to shorten gradually the length of the backing off chain, making the use of the cop firmer. The motion of the shaper or builder is communicated to the faller by means of levers, and, all being fixed in the carriage or square, the cop will not alter in shape by the springing of the carriage or floor, as when the long rails and sector are used.

HOLMES, T. *An improvement in the manufacture of driving straps or bands for machinery.* Dated Dec. 29, 1855. (No. 2950.)

This invention has for its object the application of walrus hides for driving-bands for machinery, and consists in stretching and pressing such hides and treating them with alum, with or without oil.

NEWTON, W. E. *An improved process of tanning.* (A communication.) Dated Dec. 29, 1855. (No. 2951.)

This invention consists in operating on the skins in closed wooden vessels or cylinders which are made to rotate on their axes, and conducting the process on a rotative system; that is, putting the fresh skins into the weaker and partially spent or exhausted solutions or extracts.

LILLIE, J. S. *Improvements in guns, fire-arms, and implements of war connected therewith.* Dated Dec. 31, 1855. (No. 2952.)

These improvements consist—1. In substituting for triggers cams connected with segments of screws or worm-wheels working on spindles or shafts, thus giving motion to cylinders and hammers to be employed in discharging from platforms or fixed rests guns of any calibre; also small arms with revolving breeches. 2. The patentee attaches perforated metallic discs, of the diameter of the cylinder to these frames, and in contact to the ends next to the barrels. 3. In discharging small arms from the shoulder he attaches portable rests to the lower part of the barrel, about half way between the muzzle and the breech, so as to enable the other ends of such rests to be placed on the left hip, where they may be held by the left hand during the act of firing. 4. To balls or other projectiles he attaches elastic material of the diameter of the bore of the barrel or chamber, by means of metallic pins, glue, or other adhesive material; and likewise a cylinder of cartridge paper or other strong substance as a case for the powder. When small shot are used, he attaches this case to the felt, and separates the shot from the powder by means of wadding in the interior of the case.

TURNER, A. *Improvements in the manufacture of looped fabrics.* Dated Dec. 31, 1855. (No. 2956.)

Claims.—1. The application of jacquard apparatus to knitting machinery, for forming patterns or designs in knitted goods. 2. The application to knitting machinery of lever presses acted upon by jacquard apparatus, for forming designs or patterns in the knitted goods. 3. Giving breadth to the extremity of the pressers by means of a flange, or other lateral projection, so as to prevent the pressers, when in action, from slipping off the beard of the needles.

STEVENSON, J. C., and J. WILLIAMSON. *Improvements in the manufacture of soda and alkali.* Dated Dec. 31, 1855. (No. 2957.)

These improvements relate to balling, or black ash making, in which sulphate of soda is decomposed by being heated in contact with coal and chalk or limestone, and consist in keeping back the sulphate of soda until the chalk and coal have been heated together to a high temperature, and then adding the sulphate of soda and finishing the operation in the usual manner.

TRUELOVE, H. *Improvements in gloves.* Dated Jan. 1, 1856. (No. 1.)

The parts of the glove having been cut, the patentee takes one part of the glove, and sews an elastic band all round the edge both of the fingers, hand, and wrists; and to this band the remaining part of the edges is sown.

SWIFT, F. *Improvements in carriage-wheels and axles, and in vehicles for common roads.* Dated Jan. 1, 1856. (No. 2.)

The patentee makes wheels with one series of spokes in the plane of the tyre or rim throughout their whole length, or in other words at right angles to the shaft, while a second series are sufficiently inclined to the first to form the necessary stay for the rim. He fixes each wheel to its respective axle-tree, which he makes in two pieces, and inclines them in opposite directions, so that the rim or tyre and one series of spokes stand at an incline outwards equal to the incline of the second series of spokes inwards. He mounts the axles in two bearings

bushed with brass, and he forms suitable enlargements on the axles for the reception of the screwed ends of the spokes. A further improvement consists in covering the dash iron with closely woven material, which will prevent dirt passing through, and at the same time permit air to pass through, and thus relieve the pressure when going against a head wind.

JOHNSON, W. B. *Improvements in steam boilers and engines.* Dated Jan. 1, 1856. (No. 5.)

These improvements refer peculiarly to boilers which are horizontally placed, and consist—1. In adapting a circular flue concentric, or nearly so, with the outward shell; within this flue the patentee places, by one arrangement, a furnace at one end, or by another, a furnace at each end thereof. 2. In using the above arrangements, in combination with an upper vessel connected to the boiler by pipes, and constituting a steam chamber. The improvements in steam engines relate to working expansion valves, and consist—1. In a peculiar form of cam, having two concentric rims corresponding to the extremes of working, between which there are elevations acting in different degrees. 2. In causing the roller against which the expansion cam acts to be traversed thereon by suitable means, according to the required degree. 3. In traversing the roller upon the cam by means of levers or rods, a centre of motion of which is mounted upon an axis on which the lever of the said roller vibrates. 4. In the use of valves containing suitable apertures, and capable of moving around a centre, so as to act as expansion valves by cutting off the steam. 5. In keeping the roller of the expansion valve in contact therewith by the force of steam. 6. In adapting to the rod by which motion is communicated by the expansion valve vulcanized India-rubber, in order to gain elasticity therein.

SHANKS, A. *Certain improvements in machinery for cutting screws.* Dated Jan. 2, 1856. (No. 8.)

Claims.—1. The use of dies having six or any convenient number of sides, so that they may be changed by being rotated on their axes. 2. A mode of passing one mandril through the others, one carrying the dies and the other the bolt. 3. The application of apparatus so as to give a reciprocating and backing movement to the bolt while being cut.

BULLOUGH, W. *Improvements in machinery or apparatus for sizing yarns.* Dated Jan. 2, 1856. (No. 9.)

This invention consists in dispensing with the cones driven by wheels and pinions now in general use, and in driving *the nine-inch roller by friction* pulleys or surfaces, with thumb-screws to regulate the necessary pressure.

TILGHMAN, R. A. *Improvements in the manufacture of iron.* Dated Jan. 2, 1856. (No. 10.)

This invention consists in introducing common salt directly into the lower parts of iron surfaces, where the temperature is very high, so that being immediately vaporized and diffused, it penetrates into the pores and cavities of the materials.

HAMILTON, G. *Improvements in apparatus for weighing.* Dated Jan. 2, 1856. (No. 11.)

A wheel or disc is mounted on an axis; at the centre a scale pan is attached to part of the circumference, and, in some arrangements, the position of the scale pan may be variable. To another part of the disc or wheel a weight is attached, which constantly gravitates towards a position below the axis of motion of the wheel or disc. To indicate the weight in the scale pan, a hollow ring containing a fluid, which gravitates constantly to the lower portion of the ring, points to the said weight on a dial.

SELLERS, H. L., and J. L. TALBOTT. *Improved apparatus for measuring and weighing grain, seeds, and other substances.* (A communication.) Dated Jan. 2, 1856. (No. 12.)

This apparatus consists of a cylinder divided into two compartments, and mounted on a frame, the ends of which rest on edges, carried by a Fairbank's weighing machine. A rod is thrown into action when a given amount of grain has entered either compartment, and prevents the supply of further grain. The cylinder then, by reason of its superior weight on one side, rocks in its bearings, and brings up the other compartment to be filled while the first is discharging. A counting apparatus registers the oscillations of the cylinder.

HAINES, F. *The deadening of the sound and the prevention of vibration and concussion in connection with machinery, gun, and mortar boats, and general ordnance, and other purposes.* Dated Jan. 3, 1856. (No. 14.)

This invention consists in the application of cork in various forms and to various purposes. It is used with guns, mortars, gun carriages, mortar beds, and general ordnance, in conjunction with lead or other material if necessary, or alone.

TOYE, C. *Improvements in terry fabrics.* Dated Jan. 3, 1856. (No. 15.)

This invention consists of a mode of weaving two terry fabrics at the same time in the same loom, the terries of each fabric being formed at the same time in the same loom, and over the same wire or wires.

WILLIAMS, G. *Improvements in the construction of waterclosets for ships.* Dated Jan. 3, 1856. (No. 16.)

The patentee constructs the closets with an outlet furnished with a syphon and self-acting valve, which, while allowing the soil to pass, will prevent the passage of the water, and resist the action of the wind.

DISTIN, W. A. *Improvements in pipes for smoking.* Dated Jan. 3, 1856. (No. 18.)

This invention consists in forming pipes for smoking, with the body thereof straight or of other convenient form, and having a reservoir therein to hold the tobacco to be smoked.

LYALL, J. B. *Certain improvements in carriages.* Dated Jan. 3, 1856. (No. 19.)

This invention consists partly of improvements upon a patent, dated 26th April, 1850, and relates to improved arrangements of the parts of omnibuses, two-wheeled carriages, &c.

JOHNSON, J. H. *Improvements in apparatus or means for facilitating the performance of church and other music on organs, harmoniums, pianos, and other similar keyed musical instruments.* (A communication.) Dated Jan. 3, 1856. (No. 22.)

This invention relates to apparatus to be fitted over the keys of an organ, harmonium, piano, &c., whereby when a single key is struck, the notes which are chords of the note represented by the key will be sounded also, so as to produce musical harmony.

MATHER, C., and C. MILLWARD. *An improvement in steam and vacuum gauges.* Dated Jan. 3, 1856. (No. 25.)

This invention has for its object, that the same column of mercury may be made to indicate either the pressure of steam in the boiler, or the state of vacuum in the condenser. A tube is attached to the lower end of the glass containing the mercury, and rises to any desired height; a branch tube is connected therewith, and also to the condenser, there being a three-way cock on the tube where the branch joins it. A tube is attached to the upper part of the glass containing the mercury, which is also connected with a steam boiler, and this tube has also a branch open to the atmosphere, and a three-way cock at the junction of the branch and the tube.

LACKERSTEEN, J. F. *Improvements in the prevention of collisions on railways.* Dated Jan. 3, 1856. (No. 26.)

This invention consists in laying down pipes along a railway to contain water, which, to prevent freezing, contains a solution of salt. At the end of each pipe is a piston in connection with an incline, which being pressed down by an instrument on the passing train, displaces the water and drives it to the other end of the pipe, where it acts on a piston also connected with an incline which acts upon the next train.

FOWLER, J. *Improvements in machinery for giving motion to ploughs and other implements used for cultivating land.* Dated Jan. 3, 1856. (No. 27.)

Two capstans or barrels are combined on the same frame, and receive motion from a steam engine, in such manner that one winds on a wire rope as the other unwinds it. Ploughs, &c., are attached to this wire rope between two guide pulleys, the positions of which may be varied in order to lead the ploughs continually over fresh portions of the land.

MARSDEN, C. *Improvements in the ventilation of sewers, tunnels, mines, and other confined places.* Dated Jan. 3, 1856. (No. 28.)

This invention was described and illustrated at page 127, of our last volume, No. 1696.

BACK, H. *Improvements in the application of glass to decorative purposes.* Dated Jan. 4, 1856. (No. 30.)

This invention consists—1. In adapting or applying hollow glass pillars or facings, gilded or coloured at the back (as described in a patent granted to the patentee, March 15, 1855); and, 2. In adapting and applying fluted, corrugated, diapered, or otherwise suitably decorated sheet glass, gilded or coloured at the back as above, to various uses, either alone or in combination with the hollow glass pillars or facings above referred to.

SIMMONS, W. *An improved hat body.* Dated Jan. 4, 1856. (No. 32.)

To dispense with hat linings, the patentee applies to the interior surface of the common hat body, during its manufacture, whilst the shellac or varnish is in a fluid state, a coating of cotton, wool, or silk "flock," or of glass, or sand, or any other suitable pulverised material.

GREY, R. *Improvements in machinery or apparatus for moulding bricks, tiles, and other similar articles.* Dated Jan. 4, 1856. (No. 33.)

This invention relates to a peculiar construction of machinery for making bricks, pipes, tiles, chimney pots, &c., by expelling the plastic material horizontally by continuous pressure through dies, placed at or near the bottom of the sides of a pug-mill. It consists in the employment of a vertical pug-mill fitted with an Archimedian screw, and furnished at the sides, at or near the bottom, with lateral orifices, each fitted with a suitable mould die. In front of each of these orifices is a travelling platform, running on wheels, and fitted with the ordinary rollers to ease the motion of the clay, which is introduced into the top of the pug-mill and is pressed down by the rotation of the Archimedian screw.

COMPLETE SPECIFICATIONS FILED WITH APPLICATIONS.

NEEDHAM, W., and J. KITE. *Improvements in machinery or apparatus for expressing liquids or moisture from substances.* Dated May 31, 1856. (No. 1288.)

The object of these improvements is to further carry out the principle of solidifying semi-fluids, for which the inventors obtained letters patent, No. 1669, dated 14th July, 1853; and they consist in machinery varying from that described in the specification of the patent aforesaid, and rendering the apparatus more applicable in its improved arrangement for the expression of liquid or moisture from substances not mentioned or defined in the former specification.

CHATEAUNEUF, H. G. DE. *Improvements in apparatus for washing and bleaching clothes and other materials, to be called "the Steam Washing Lixiviateur."* Dated June 14, 1856. (No. 1410.)

This invention has for its object—1. Improvements in a process and apparatus patented 24th Aug., 1854. 2. The application of a kind of railway with crane serving to move the lids of the apparatus, and introduce and take away therefrom the clothes in great quantities. 3. A complete series of liquid and steam pipes which direct the currents to and from and in the several apparatus by cocks, either by the pressure of the steam or the weight of the liquids. 4. The application of a wheel to the washing of clothes, with modifications for facilitating its action and appropriating it to the washing cold and warm, soaping, blueing, &c. 5. A new propagator of heat with double circulation of heat and air, with the addition of a gas-meter for the introduction of oxygen gas, &c.

GREEN, C. E. *Improvements in tents, huts, and camp hospitals.* Dated June 18, 1856. (No. 1439.)

These improvements consist—1. In the construction of a framework in wood, iron, brass, bronze, bone, cane, or any other material, arranged in several parts, and held together by hinges, or any other known method of fastening, and capable of folding up to small dimensions in one or more parts for portability, and expanding at pleasure, forming a compact whole or perfect tent or hut, with boarded flooring and crossed joists. 2. In making, framing, and covering tents, huts, or camp hospitals in two or more thicknesses, so devised as to allow a free current of hot or cold air, as may be required, the materials used being singly or severally linen, woollen union, serge, skins, matting, oiled, vulcanized, waterproof, or any other known fabrics, with metallic slides, for the purpose of thoroughly ventilating the interior, *the whole being waterproof,* and equally a *non-conductor.*

RADLEY, W. *Improvements in machinery, apparatus, materials, and processes for preparing and treating auriferous, argentiferous, and cupreous rocks, minerals, and alluviums, parts whereof are applicable to other purposes.* Dated June 20, 1856. (No. 1450.)

This invention relates—1. To the preparation of the rock mineral and alluvium. If the substance is quartzose or trappeau the inventor breaks it into pieces a hen's egg in size, and subjects it to calcination in a close kiln, with or without an alkaline or earthy sulphide or chloride, during one to four hours, at a full red to white heat, and withdraws it into water, preferably hot, and thus renders it more friable and easy to crush and grind. 2. To crushing and grinding. The material to be crushed is to be introduced into a "gyro stamper" constructed thus:—A basin or mortar of cast iron or stone, of the general form of an apothecary's mortar, is used, but instead of being hemispherical in its cavity, it is preferred to make it a paraboloid, and identical with one half, or less than one half, of an ellipse sectionally of small eccentricity, cut in its transverse diameter. To this mortar is adapted a pestle-head of cast iron, steel, or stone, in the general form of this well-known instrument, whose lower surface shall answer to that of the elliptic mortar, and occupy from one half to two-thirds of the concave surface of the same. 3. To the machinery for effecting the amalgamation of gold and silver as a separate operation, and consists of an amalgamating barrel, a mercury retort and furnace, and an amalgam separator. 4. To exposing pyritic minerals, before or after the process of auriferous amalgamation and the action of the atmosphere, in beds, heaps, or layers, underlaid with conduits leading to tanks to collect and reserve the solutions percolating through. Upon these beds of material water is thrown from time to time in a shower to imitate rain. 5. To those quartzose or trappeau rocks, minerals, and also alluviums, wherein the gold, silver, &c., is in such a state of combination, or is otherwise in a metamorphic condition, that none of the previously described processes can separate them therefrom, and consists in acting upon the substance, before or after calcination, but preferably after being pulverized, first with dilute sulphuric acid to separate all matters that may be found soluble therein, and secondly, after washing and subsidence, with a proper mixture of hydrochloric and nitric acids within a Woolfe's series of any convenient material, or with chlorine produced from any ordinary generative mixture—the rock mineral or alluvium being diffused in the compound acid in the one case, and in water in the other. 6. To the sulphurous fumes escaping or

liable to escape from the processes of calcining or washing pyritic substances generally, and consists in the collection of such fumes, and their conversion into sulphurous and sulphuric acids.

FORD, A. *Preparing and dissolving in naphtha or oil of turpentine, vulcanized India-rubber for the purpose of waterproofing, and for all or any of the other purposes for which the same not so prepared and dissolved is now applicable, and especially for the coating of iron ships' bottoms.* Dated June 27, 1856. (No. 1512.)

The inventor first cuts the vulcanized India-rubber into small pieces, and places it in a boiler, having within it an agitator or stirrer, kept in constant motion during the process. The only openings into this boiler are a man hole with a screw top; a safety-valve which comes into action only when the pressure on the inner surface of the boiler exceeds 25 lbs. to the square inch, and the opening occasioned by the passage of the stem of the agitator, which passes in at the summit. He then applies heat in such a manner as that three-fourths of the outer surface of the boiler shall be at once exposed to its influence, and at a temperature of never more than 300° Fahr.; and he continues the same until the India-rubber shall be reduced to the consistence of dough, when he takes it out, and having mixed with it a sufficient portion of French chalk in powder to remove its adhesiveness, passes it a few times through metal rollers, after which it is capable of being dissolved in naphtha or oil of turpentine in the manner of ordinary rubber. The *rationale* of the process is, that by means of the heat applied to the boiler, he decomposes a small portion of the vulcanized India-rubber, whereby a gas is generated which, filling the interior of the boiler, acts upon the remaining portion, and softens it. The not allowing the gas to escape is, therefore, a very important feature.

KEY, T. *An improved knife-cleaning machine.* Dated July 4, 1856. (No. 1571.)

This invention consists of a roller brush made with bristles or any other suitable material, a sufficient length to admit knives to be laid round at each end. A cylinder is passed over the brush to keep the knives on the bristles; the cylinder is closed with straps to lighten the cylinder as the bristles wear away.

CHENOT, A. L. S., and E. C. A. *A method of extracting or eliminating extraneous substances from steel sponges.* Dated July 7, 1856. (No. 1587.)

This process consists in separating, by mechanical power, the extraneous substances which, owing to their little density, will float on the surface of the melted steel, by throwing into the crucible, previous to the spray, a quantity of sand, pounded bricks, or other refractory substances, the object of which is to cool the dross, which is afterwards skimmed off with a spattle.

CHENOT, A. L. S., and E. C. A. *Improvements in sorting ores or separating metals from each other, and from certain combinations with other substances.* Dated July 7, 1856. (No. 1588.)

Claims.—1. Sorting ores or separating metals from each other, and from other substances by electric or other process. 2. The means specified in order to attain this result.

CHENOT, A. L. S., and E. C. A. *Improvements in machinery for compressing metallic sponges and other substances.* Dated July 7, 1856. (No. 1589.)

Claims.—1. The compression of ores, metallic sponges, and other bodies, for the purpose of obtaining a considerable reduction in their bulk, thereby preserving the products, and causing them to assume determinate forms. 2. The means specified of obtaining the said compression.

CHENOT, A. L. S., and E. C. A. *Improvements in apparatus for the reduction of metallic oxyd.* Dated July 7, 1856. (No. 1590.)

This invention appears to consist mainly in producing "immediate calefaction, either by injection of flames into the bulk to be reduced, or sometimes by burning in the bulk the fuel mixed and blended with the oxide to reduce."

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

FORD, A. *Preparing and dissolving in naphtha or oil of turpentine vulcanized India-rubber, for the purpose of waterproofing, and all or any of the other purposes for which the same, not so prepared and dissolved, is now applicable.* Dated Dec. 29, 1855. (No. 2944.)

Vulcanized India-rubber is cut into pieces and placed in a globular or oval-shaped boiler, having chimneys placed horizontally, and subjected to heat under pressure, until by the action of the gas within it is sufficiently softened, when it is taken out, and being worked up with French chalk, sulphur, charcoal, lamp-black, black-lead, or some other metallic oxide, is fitted for applying either in solution or otherwise.

BROADBENT, J., and S. P. YOULE. *Improvements in machinery or apparatus for cutting out the gores of umbrellas and parasols, which said improvements are also applicable to cutting out forms or shapes for other purposes.* Dated Dec. 29, 1855. (No. 2945.)

This invention consists in cutting out gores or other shapes by means of cutting edges or blades fixed upon the outer surface of a roller. Another roller is employed as a bed roller for the knives or blades to cut against.

COWPER, C. *Improvements in the treatment of coal, and in the purification, desiccation, and agglomeration of coal, and in machinery and apparatus for such purposes.* Dated Dec. 31, 1855. (No. 2953.)

This invention relates to improvements in separating coals from pyrites, schist, &c., by the action of water, and in drying the coal, and converting it into artificial fuel, or agglomerating it with the assistance of heat, and in apparatus for such purposes. The inventor constructs apparatus on the same principle as that described in the specification of his patent, dated 2nd Nov., 1849, with various modifications.

SALTER, J. *Improvements in apparatus for promoting the draught in chimneys, and for ventilating apartments.* Dated Dec. 31, 1855. (No. 2954.)

The improved apparatus consists of an air chamber with openings surrounding, or partially surrounding, the fire-grate. A damper or valve is applied to regulate the quantity of air supplied. The apparatus for ventilating consists of a syphon, the longer leg of which reaches to near the top of the apartment, and the shorter leg is placed so near to the fire-place that the heat, by rarifying the air in the short leg, causes the air from the upper part of the apartment to descend the longer leg of the syphon, and pass up the chimney.

TAYLOR, J. *Improvements in apparatus for raising and lowering weights.* Dated Dec. 31, 1855. (No. 2955.)

This invention consists in the combination of apparatus for raising and lowering weights with a travelling or locomotive engine.

COTTAM, G. H. *Improvements in applying detonating or exploding signals on the rails of railways.* Dated Dec. 31, 1855. (No. 2958.)

In this invention the signals are made with an inclined end, in order that they may be raised at their other ends when the wheels pass over them, and such other ends are made suitably for a slide to receive and hold them. An upright trunk or holder is employed at the side of a railway, and a slide is arranged to be moved by a wire, cord, or otherwise, from a distance, so as to put a signal on to a rail.

CALVERT, J. *Improvements in extracting metals from their ores.* Dated Jan. 1, 1856. (No. 3.)

The inventor proposes to pass an electric current through the ore whilst in the furnace, thereby compelling the metal either to precipitate in contact with an electrically opposite substance, or to aggregate in nodules.

NEWTON, A. V. *A novel system of propulsion, applicable to land and water.* (A communication.) Dated Jan. 1, 1856. (No. 4.)

This invention relates to a system of locomotion on land, when compressed air (or water) is employed as the propelling power, and denominated "Gardner's Aërial Railway." The carriage is mounted upon six horizontal wheels, which run in grooves in the outsides of the masonry of the road, which is raised from the ground. These wheels (four in front and two behind) are coupled together, and always preserve their parallelism with the body of the carriage. The road is provided with an atmospheric tube, the upper extremity of which terminates in plates of a double V form, pressed together by pads furnished with counterweighted rods. When jointed arms are depressed by means of a sliding lever by the driver, they raise counter weights, and allow the air valve to open. The compressed air then rushes into a collapsible air cheat underneath the carriage, and tends to tighten its draught, and then passing from this chest, acts upon inclined wings mounted at the sides of the carriage, and propel it forward.

COCHRANE, A. *Improvements in collecting and distributing water and alluvial deposits contained in sewage and other water.* Dated Jan 1, 1856. (No. 6.)

The object is to convey water or sewage along pipes having holes or slots formed at intervals, whereby, as it passes along, it may be deposited in tanks, whence it may be removed and used as a manure, &c.

THURRELL, J., E. M. MULLER, and J. R. CHIDLEY. *Improvements in transmitting fac-simile copies of writings and drawings by means of electric currents.* Dated Jan. 1, 1856. (No. 7.)

In this invention the writing, &c., to be transmitted is written or drawn upon any substance which is a good conductor of electricity, with a non-conducting varnish. There are metal cylinders at the stations, around or upon one of which the writing or drawing is placed, and around or upon the other is placed a piece of ordinary writing paper upon which a fac-simile is traced or inscribed, by means of a point or roller which traverses the first paper, and a pencil or other marking point which traverses the second, the two being connected by a single wire.

GILL, R. *Improvements in the arrangement and construction of the fire-flues and passages of steam boilers, for facilitating and*

improving the combustion of smoke. Dated Jan. 3, 1856. (No. 13.)

These improvements consist in the construction of the fire-flues and passages so that the fire is divided into two parts, each furnished with a separate flue to the chimney, and also with return flues or passages, whereby the smoke and flame from one division is brought back and passed through the other division of the fire, which is in a bright incandescent state.

SCHLESINGER, J. W. *Improvements in the mode of using emery, glass, and sand, or other substances on linen or other material, and in the machinery applicable to the manufacture thereof.* Dated Jan. 3, 1856. (No. 17.)

The inventor makes conical tubes of linen or paper, and, when perfectly dry, he covers them with glue, upon which he immediately places emery powder, ground glass, or sand, &c. He then makes conical pieces of wood, on which these tubes are fitted.

BRAMBACH, H. *Converting dry pitch and other resinous substances, also coal-tar and other tars, into neutral essential oils.* Dated Jan. 3, 1856. (No. 20.)

The inventor melts with a slow fire the substance to be distilled, and mixes it with lime sufficiently soaked to fall into powder. He puts the mixture into a crucible, furnished with a tube in communication with a refrigerator, and distils by gradually increasing the fire. A small portion of the products consists of coal-gas, but the greater part is condensed in the refrigerator, and furnishes a brown and light essential oil quite neutral. By applying to this the known methods of rectification, he obtains an essential oil of a light yellow colour, which does not absorb the oxygen of the air, burns in lamps without smell or soot, and can be applied to dissolve resinous substances, caoutchouc, &c.

NEALE, E. V. *Improvements in labels.* Dated Jan. 3, 1856. (No. 21.)

These improvements consist in inserting plates of glass, bearing any desired name or inscription, into metallic frames, so as to give metallic protection to the front and back edges of the glass.

STEWART, A. *Improvements in measuring the human figure, and in fitting garments thereto.* Dated Jan. 3, 1856. (No. 23.)

According to this system, skeleton pattern portions of garments are primarily prepared and applied to the parts of the human figure to which they correspond. One set of these skeleton sections answers for all sizes of the figure; the discrepancies between each figure and the sectional pattern portions are marked off upon the pattern pieces.

JOHNSON, J. H. *Improvements in breech-loading fire-arms.* (A communication.) Dated Jan. 3, 1856. (No. 24.)

This invention relates to certain arrangements of the parts of such arms, whereby a great rapidity of firing is obtained, and the arm is fitted with all the appurtenances requisite for cleaning, oiling, and dismounting the several parts.

BARLOW, H. B. *Certain improvements in machinery for carding cotton and other fibrous substances.* (A communication.) Dated Jan. 4, 1856. (No. 29.)

This invention consists in making carding engines sufficiently wide to admit of two laps, made on the ordinary blower lap machine, being placed at the feeding end of the carding engine.

HART, C. *Improvements in portable steam engines, and in apparatus connected therewith, for tilling and cultivating land.* Dated Jan. 4, 1856. (No. 31.)

This invention will be described shortly.

HUDSON, T. *An improvement in furnaces.* Dated Jan. 4, 1856. (No. 34.)

This invention consists in supplying air through hollow bars, which convey the air from the outside of the furnace into a box or aperture at the back of the bridge, which is covered with gratings or perforated plates, through which air, heated in its passage along the hollow bars, issues in jets or streams.

KEY, T. *An improved knife-cleaning machine.* Dated Jan. 4, 1856. (No. 35.)

This invention refers to a rotary knife cleaner, and consists in mounting upon a spindle a circular or roller brush double the length of the knife blades, around the surface of which is placed a thin sheet of iron or other material, of sufficient width and length to encircle the same, and around this sheet of iron are placed two leathern straps, which, when buckled or drawn tightly round, bring the inner surface of the iron in close contact with the surface of the brush. It is then fixed in a box or case, in which are a number of apertures describing a circle, the diameter of which is equal to the diameter of the brush. Through these apertures the knives are passed, and the blades pass between the surface of the brush and the sheet.

PROVISIONAL PROTECTIONS.

Dated August 4, 1856.

1833. Charles Gustavus Gottgetreu, Charterhouse-square, London. Lithographic printing in oil and varnish colours and metal on glass, wood, papier mâché, marble, metal, porcelain, or any other material that offers a suitable surface.

1835. Charles Théodule Launay and Jules Chopin, gas-fitters, of Paris, French Empire. Improvements in increasing the illuminating power of gas.

1837. Thomas Barnabas Daft, of the Irish En-

gineering Company, Dublin. Improvements in the manufacture of cast-iron pipes.

1839. Josiah Firth, of Heckmondwike, York, carpet manufacturer, and Joseph Crabtree, of Millbridge, near Heckmondwike aforesaid, machine maker. Weaving Scotch, Kidderminster, and Dutch carpets, by means of a power loom.

Dated August 5, 1856.

1841. James Benjamin Bowen, of Chipping Norton, Oxford. Improvements in the manufacture of gloves.

1843. Thomas Marples, of Derby, Millstone, merchant. Improvements in corn mills.

1845. Andrew Smith, of Mauchline, Ayr, N.B., gentleman, and William Smith, of the same place, gentleman. Improvements in ruling or delineating ornamental figures.

1847. Edwin Blomeley, of Fernhill-mill, Bury, Lancaster, manufacturer. Improvements in the manufacture of fabrics applicable to various purposes, for which airproof and waterproof fabrics are usually employed.

1849. Alfred Vincent Newton, Chancery-lane, Middlesex, mechanical draughtsman. An improvement in primers for fire-arm cartridges. A communication.

1851. Joseph Auguste Monnier, of Marseilles, France. Improvements in transmitting motive power.

Dated August 6, 1856.

1853. George Holworthy Palmer, of Adelaide-road, Haverstock-hill, Middlesex, civil engineer. Improvements in furnaces for generating heat.

1855. William Watt, of Belfast, Antrim, Ireland. Improvements in treating or preparing Indian corn and other grain for fermentation and distillation.

1857. William Hall, of Birmingham, Warwick, gentleman, Elisha Wylde, of the same place, engineer, and William Waite, also of the same place, engineer. Improvements in steam engines.

1859. James Farrar, of Bury, Lancaster, agent, and Henry Spencer, of Rochdale, in the same county, agent. Improvements in apparatus for regulating the pressure and flow of gaseous fluids.

Dated August 7, 1856.

1860. Lionel Weber, of Bellevue Hotel, Bruxelles, Belgium. A combination applicable to keys of door-locks to prevent their being opened by pliers or other instruments from the outside.

1862. William Green, of York-street, City-road, Middlesex. Improvements in the manufacture or production of fabrics and surfaces, in imitation of, and as substitutes for, leather for bookbinding and other uses, and in machinery or apparatus for effecting the same.

1864. Coleman Defries, of Houndsditch. Improvements in the roof lamps of railway carriages.

Dated August 8, 1856.

1866. Robert Davenport, of Jonathan-street, Vauxhall, Surrey, potter. Certain improvements in kilns for burning pottery, earthenware, china, porcelain, and similar substances to enable them to consume their own smoke.

1870. William Gorse, of Birmingham, Warwick, manufacturer. A new or improved door fastener. A communication.

1872. John Stephens, of Suffolk-place, Westminster, esquire. An improvement in pipes for smoking.

Dated August 9, 1856.

1876. Thomas Whittaker, of Accrington, Lancaster, millwright. Improvements in the mode or method of washing or cleansing woven fabrics.

1878. John Darlington, of Cannon-street, London. Improvements in superheating steam. A *communication from G. A. Hirn, of Colmar Haut, Rhine, France.*

1880. Chapman March, of Alwalton-mills, Huntingdon, miller. Improvements in propelling and working ships and vessels.

1882. Edward Owen, of Aberdeen-terrace, Blackheath, Kent, chemist. Improvements in the manufacture of gas, and in the obtainment of products arising in such manufacture.

Dated August 11, 1856.

1884. Peter Armand Lecomte de Fontainemoreau, of Rue de l'Echiquier, Paris, France. A new electro-motive engine. A communication.

1886. Alexander Symons, of George-street, Mansion-house, London, and Edward Burgess, of Clerkenwell-green, Middlesex. Improvements in noctuarys or telltales for ascertaining the fidelity of watchmen, and for other purposes, and in the application of electricity to such apparatus.

Dated August 12, 1856.

1888. Nicholas Doran Maillard, of Dublin. An improved mechanical and magnetic compass.

1890. Edwin Firth, of Flush-mills, Heckmondwike, near Leeds, York. Improvements in finishing mohair cloth.

1892. William Henry Brown, of Albion Iron and Steel Works, Sheffield, York. Improvements in steam hammers.

Dated August 13, 1856.

1894. David Lesser, of Manchester, Lancaster, confectioner. Certain improvements in machinery or apparatus for making "lozenges," or other similar articles.

1896. William Church, of Birmingham, Warwick, engineer, and Henry Whiting Hamlyn, of Birmingham aforesaid, corn factor. An improved method, or improved methods, of constructing or building hay and other ricks.

Dated August 14, 1856.

1898. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in the manufacture of artificial stone and building and paving materials. A communication.

1900. Alfred Priest and William Woolnough, of the Iron Works, Kingston-on-Thames. Improvements in horse hoes.

1902. Thomas Bilbe, of Nelson Dock, Rotherhithe, Surrey, ship builder. Improvements in the construction of ships and other vessels.

1904. James Bannehr, of Bedford-circus, Exeter. Improvements in the manufacture of name and sign plates, boards and slabs, door and house numbers, street names, tombstones and monumental slabs, and inscriptions, by substituting earthenware or porcelain instead of the materials now in use for the above named articles.

1906. John Goddard, of Moss-row, Bagslate, near Rochdale, Lancaster, cotton carder, and George Hulme, of George-street, Rochdale, machine maker. Improvements in carding engines for the more speedy and effectual doffing or stripping of the cotton, woollen, silk, or other fibrous substances therefrom.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," August 26th, 1856.)

926. C. F. Stansbury. An improved mode of splicing and fastening the adjacent ends of the rails of a railway truck. A communication.

927. T. Hollingworth. Improved machinery for dusting or cleaning rags.

928. U. Scott. Improvements in metal fittings for furniture.

935. C. Moret. Improvements in rotatory steam engines.

939. C. F. Stansbury. A new instrument for determining the position and bearing of ships at sea. A communication.

940. W. Adkins. Measuring fabrics, which he proposes designating the "Automaton Measurer, or Draper's Assistant."

946. F. J. Bouwens. A new rotative steam engine.

949. S. Mellor and T. Young. Certain improvements in machinery for supplying water to steam boilers.

955. W. J. Cantelo. Improvements in the preservation of vegetable matters.

959. A. S. Vimont. A new system of machinery for spinning wool and any other fibrous material.

986. F. Allman and D. Bethune. Certain improvements in apparatus for the production of steam, and in the apparatus employed in its application to motive purposes.

997. R. Lakin, J. Thompson, E. G. Fitton, and F. A. Fitton. Improvements in or applicable to certain machines for preparing and spinning cotton and other fibrous substances, some of which improvements relating to apparatus for lubricating, and to the construction of studs; are also applicable to machinery for other purposes.

999. T. Lawes. Improvements in the construction and manufacture of an implement used in tilling the land.

1017. T. W. Rammell. Improvements in pen and pencil holders.

1018. I. A. Boss. Improvements in preparing cane, in order to render it suitable to be used as a substitute for whalebone. A communication.

1025. L. J. B. Manery. Certain improvements in manufacturing cast steel.

1033. R. A. Brooman. Improvements in compressing, regulating the pressure and flow of, and conveying gas, parts of which are applicable to air and other fluid pumps. A communication from P. Hugon, of Paris.

1156. W. Maryehurch and J. Griffiths. Improvements in horse rakes, part of which is applicable to two wheel carriages.

1169. W. Thistlethwaite. Certain improvements in photography. A communication.

1193. W. C. McBride. Improvements in machinery for scutching flax and other vegetable fibrous substances.

1299. G. Gidley and W. Christopher. Reducing the bottle or imported India rubber to a transparent liquid state, so that it may be used as a transparent varnish or solution for mixing with colours.

1336. W. Smith. Improvements in apparatus for regulating the supply of air to furnaces.

1384. W. H. Westwood, T. Wright, and E. Wright. An improved stop or regulating valve.

1430. F. C. Bakewell. Improvements in percussion bomb shells. A communication.

1449. J. D. Damasio. A new process of making illuminating and heating gas by a double distillation without retort. A communication.

1546. G. E. Dering. Improvements in galvanic batteries.

1597. E. C. Healey and E. E. Allen. An improvement in preparing for use veneers, paper, and other fabrics or sheets made of fibres.

1602. J. H. G. Wells. Improvements in pistons for steam and other motive power engines, and pumps in general, and which improvements are also applicable to stuffing boxes. A communication.

1603. J. H. G. Wells. Improvements in governors or regulators. A communication.

1611. A. Gray and J. Rawson. Improvements in means or apparatus for lubricating.

1626. M. Defries. Improvements in moderator and other lamps.

1634. C. W. Lancaster. An improved method of or apparatus for inking, printing, or stamping surfaces. A communication.

1740. S. F. Berthies. An improvement in engines to be worked by a new elastic fluid in substitution of steam generated out of water.

1811. R. A. Brooman. An improvement in the construction of carriages and wagons. A communication.

1812. R. A. Brooman. An improved augur or boring tool. A communication.

1814. W. Coltman. Improvements in knitting machinery.

1837. T. B. Daft. Improvements in the manufacture of cast iron pipes.

1841. J. B. Bowen. Improvements in the manufacture of gloves.

1855. T. Evans. Improvements in harness.

1864. C. Defries. Improvements in the roof lamps of railway carriages.

1880. C. March. Improvements in propelling and working ships and vessels.

1882. E. Owen. Improvements in the manufacture of gas, and in the obtainment of products arising in such manufacture.

1892. W. H. Brown. Improvements in steam hammers.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1853.

1942. Charles Watt and Hugh Burgess.
1949. Alexander Cuninghame.
1959. James Webster.
1963. John Whiteley.
1937. Alfred Swonnell.
1977. William Austin.
1982. Eugène de Varroc.
2022. William Beckett Johnson.

LIST OF SEALED PATENTS.

Sealed August 20, 1856.

1856.

425. Thomas Smith and Joseph Gill.

Sealed August 22, 1856.

463. David Jones.
471. William Sangster.
475. Bennett Johns Heywood.
487. Samuel Henn and Thomas Haddon.
508. John Smith.
522. Foster Connor.
542. John Aspinall.
544. John Venables.
598. Edmund Alfred Pontifex.
630. Henry Bessemer.
1004. Thomas Walker.
1268. Alfred Vincent Newton.
1342. Archibald Sinclair.
1356. Adam Stamm.
1410. Hector Grand de Châteauneuf.
1478. John Taylor.

Sealed August 26, 1856.

228. Robert Barrow.
509. Isaac Westhorp.
513. Elisha Thomas Archer.
523. Charles Barlow.
524. William Allen Turner.
538. Robert Maynard.
543. John Edward Hodges.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
July 24	3862	G. Neall	Northampton	Gas stove.
29	3863	W. Devon & G. Saunders	Stratford	Water valve.
,,	3864	R. Waygood	Newington Causeway	Water-tight spindle bearing.
31	3865	C. W. Lancaster	New Bond-street	United Service square.
Aug. 2	3866	W. Chamberlain	Dodbrook, Devon	Compound spade plough.
4	3867	W. Middlemore	Birmingham	Hobble for cattle.
19	3868	W. Thistlewood	Birmingham	Button and fastening.
25	3869	J. and D. Holloway	Birmingham	Buckle.
		PROVISIONAL REGISTRATIONS.		
July 25	786	S. Frankenstein	Old Kent-road	Basting apparatus.
26	787	H. Searle & G. Rickarby	Oxford	Envelope.
28	788	H. Millward and Sons	Redditch	Needle case.
,,	789	H. Millward and Sons	Redditch	Needle case.
Aug. 2	790	H. D. Francis	Bloomsbury	Jacquard stereoscope.
7	791	W. Healey	Leicester	Elastic wristband.
22	792	J. Coney	Birmingham	Laths for bedsteads, &c.
,,	793	G. G. A. L. M. Schelham	Birmingham	Pen holder.
,,	794	Brumaux and Léchelle	Paris	Pen holder.
23	795	G. Voigt	Kildare, Ireland	Friction break for wheels.

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LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, *in the City of London.*—*Sold* by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, *Dublin; W. C. Campbell and Co., Hamburg.*

Mechanics' Magazine.

No. 1726.] SATURDAY, SEPTEMBER 6, 1856. [PRICE 3D.

Edited by R. A. Brooman, 166, Fleet-street.

CLIFF'S REGULATORS FOR FURNACES.

Fig. 1.

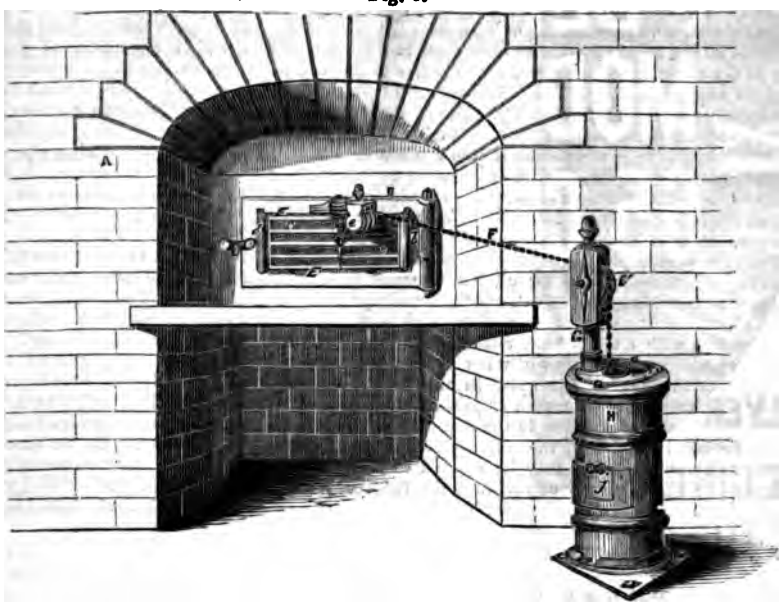
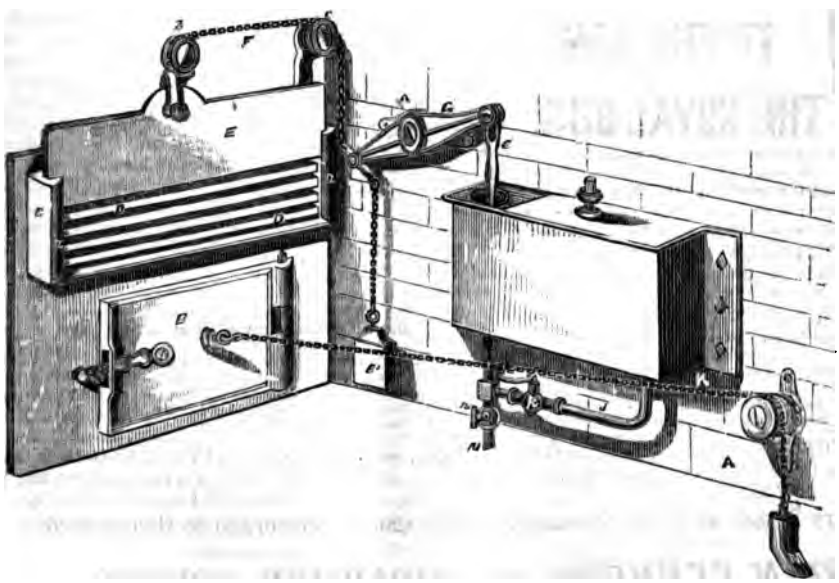


Fig. 4.



CLIFF'S REGULATORS FOR FURNACES.

Mr. J. Cliff, engineer, of Burton-on-Trent, has recently patented an invention which consists in admitting into and shutting off from furnaces a supply of atmospheric air through valves or apertures, the opening and closing of which are regulated by the weight of a liquid, or by a float, piston, or plunger worked by liquid, whether such admission of air take place through the furnace door, over the door, or through passages opening into any desired part of the furnace.

When the admission of air is to take place through the door, he fits in a frame therein vertical plates, with perforations or apertures formed therein, but in such manner that the apertures do not come opposite to each other in a horizontal line, and on the outside of the door he fits a corresponding plate, which is free to rise and fall when worked in the manner hereafter explained, and so bring the apertures therein wholly or partially open or shut to corresponding apertures in the outer plate of the frame. Or he fits plates into a frame, which he affixes to the furnace door in such manner as to intercept the air entering the furnace through them, and divide it into streams or jets; and he employs a sliding plate without apertures therein, worked as hereafter explained, to regulate the admission or shut off the supply of air through them. In order to work the outer plates for admitting or cutting off the inflow of air, he connects them either to a water weight, or to a float, piston, or plunger.

When the sliding plate is worked by a plunger or float, he employs a vessel separated into two compartments, one for containing water under pressure, and the other for containing a piston, plunger, or float, which is made to fit it accurately; both compartments are connected through a pipe, carried from the bottom of one to the bottom of the other, and provided with a stop-cock; another stop-cock is fitted to the plunger compartment.

"By regulating the outflow of water from the water weight, or from the plunger compartment, or the level of the water in the regulating vessel, the time during which the sliding plates are to remain open or partially open can be nicely adjusted and regulated," says the patentee, "according to the requirements of the furnace to be supplied with air. For instance, in addition to the ordinary means of admitting air to furnaces, the air compartments before described may be applied to regulate the admission of air immediately after placing a fresh supply of fuel into the furnace, when a greater quantity of air will be found necessary to effect perfect combustion, or as nearly so as may be, than after the fuel has been some time under distillation."

Fig. 1 of the accompanying engravings is a front view of a furnace door, constructed according to the first-mentioned arrangement, that is to say, provided with an outer plate formed with apertures, raised and lowered for admitting and shutting off air from the furnace by the action of a water weight. Fig. 2 is a transverse section through the furnace door; and Fig 3, a section of the water weight or water bucket detached. A, A, is the brickwork of the furnace; B, the door; C, C, C, vertical plates, fitted in a frame D, fixed in the door. These vertical plates are so placed in the frame that a small space is left between each, and they are formed with horizontal openings or slots *a*, *a*, *a*, extending nearly the whole breadth of the door; the slots are so contrived that the spaces or openings in one plate do not come directly opposite to those in the other plate in a horizontal line. E is a plate on the outside of the door, sliding in guides *b*, *b*. This plate is also formed with horizontal openings or slots *c*, *c*, *c*. F is a chain, attached at one end to an eye *d* in a bar on the back of the plate E, and passing over a pulley *e*, mounted in a swivel, fixed at the top of the door, and free to turn to the right or left, so as to allow the chain play when the door is opened and shut. The chain F passes over another pulley *e'*, mounted on a standard G, fixed to the cover *f* of a reservoir of water H, placed in a suitable position with respect to the furnace door. In this cover *f* is an orifice through which the chain passes, and from its extremity a water bucket or water weight I, placed within the reservoir, is suspended. This weight I (shown separately in fig 3), consists of a vessel having at bottom a valve *h* opening inwards. *i* is a regulating tap fixed to the bottom of the vessel. There is an opening *j* in the side of the reservoir, through which an attendant may insert his arm to regulate the tap. A sufficient quantity of water to fill the bucket should be kept in the reservoir H, but not sufficient to rise above the level to which the vessel descends when the chain is tightened by the closing of the door, as to be presently explained. The action of the apparatus is as follows:—On opening the furnace door the chain F is slackened, and the vessel I will descend in the reservoir by its gravity, and fill itself through the valve *h*, opening inwards. On closing the door the chain becomes tightened over the pulleys, and draws the vessel up out of the water. The vessel thus charged, being of greater weight than the sliding plate E, raises the latter. When the door is quite closed, the vessel I and plate E are raised to their full extent, and according to the outflow

through the tap *i*, so will the vessel become gradually of less weight than the sliding plate which will consequently as gradually fall, until it completely shuts off the passage of air through it into the furnace.

Fig. 4 is a perspective view of a furnace, provided with air plates above the door, from which the air is admitted and excluded by a sliding plate without apertures, raised and lowered by the opening and shutting of the door through a float, piston, or plunger acting in a water vessel. Fig. 5 is a vertical section of the water vessel: and fig. 6, a transverse section through the frame of the air plates. A, A, is the brickwork of the furnace; B, the door; C, the frame, fitted or formed above the door; D, D, are two rows of plates or louvres, fixed in the frame, and extending across it from end to end, the distance between the inner and outer rows being the same as that between each separate louvre of the same row. The rows of plates are placed, with respect to each other, as shown in the cross section. E is a sliding plate, fitted in guides *a*, *a*, formed in the sides of the frame, on the outside of the furnace. This plate is suspended by a chain F, attached at one end to the top of the plate E at the centre, and carried over pulleys *b*, *c*. From the pulley *c*, the chain is attached to one end of a beam or lever G, free to move on its centre. The further end of the beam G is attached to the rod *e* of the piston I. *e'* is a counterpoise, connected to the inner end of the beam; H is the water vessel, divided into two

Fig. 3.

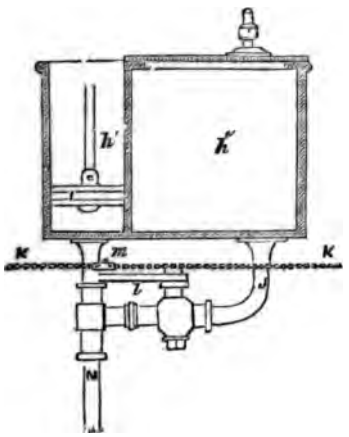


Fig. 5.

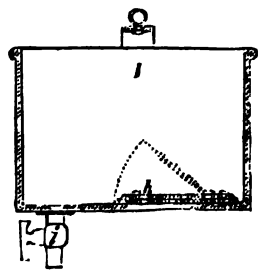


Fig. 6.

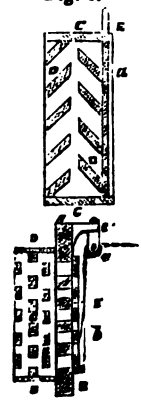


Fig. 2.

compartments *h'* *h''*; the compartment *h'* is that in which the piston I works; the compartment *h''* contains water under pressure, and is closed at top. Pressure may be exerted on the surface of the water in this compartment by admitting steam through a pipe *i*, attached to its cover. N is a discharge pipe, leading from the bottom of the compartment *h''*, and provided with a stop-cock *n*; J is a pipe, leading from the pipe N to the bottom of the compartment *h''*, and thereby connecting the two compartments; *k* is a cock, in the pipe J, between the two compartments, with a lever handle *l*, on the end of which a swivel *m* is mounted; K is a chain, connected at one end to the door of the furnace. This chain is attached to the swivel *m* on the handle of the cock *k*, and then brought over a pulley L. M is a weight, suspended from the end of the chain nearest the last-mentioned pulley. The action of the apparatus is as follows:—Suppose the door of the furnace to be closed, and the piston I at the bottom of its stroke, and the stop-cock *n* closed, then on opening the door B, the chain K will be drawn back by the weight M, and, being attached to the handle of the cock *k*, will open the cock, and thus allow the water under pressure in the compartment *h''* to flow through the pipe J, raise the piston I, and consequently the sliding plate E, through the beam G and chain F. As long as the cock *n* is closed, the sliding plate E will remain raised. Now, to shut off air entering through the plate F into the furnace, the cock *n* is opened, when the water will flow out, the piston will descend, and consequently the sliding plate will fall by its gravity. The descent of the plate, and consequent admission and exclusion of air, are governed by the rapidity of the descent of the piston, and this again is regulated by the extent to which the regulating cock *n* is opened.

ON HEAT AND LIGHT GENERALLY;

AND ON DAGUERRE'S, MOSER'S, DRAPER'S, BECQUÉREL'S, AND PROFESSOR STOKES'S DISCOVERIES ON THESE SUBJECTS.

BY HORATIO PRATER, ESQ.

M. ARAGO seems to have found that if a magnetic needle be freely suspended in an hermetically sealed glass case, and a copper disc be set in motion underneath it, the motion is communicated. This shows Liebig, perhaps, right in regard to atoms in motion communicating the same to others in fermentation. It will also tend to show that something like a principle of sympathy exists in inanimate matter.

The above copper disc experiment gives presumptive evidence that the sun's motion on its axis may, by the same power, induce a like motion in the planets. I think, also, that the very communication of heat by mere *approximation* of a heated body to a cool one is best explained by the opinion of a *sympathetic* power as an *essential property* of heat; and as this is probably the essence of all motion (viz., a vibration, if not of atoms of matter, of atoms of an *ether*), the facts above alluded to of Arago and Liebig may be embraced by the general principle, that masses or atoms of matter tend, when in motion, to communicate this state by sympathy to approximated bodies. In other words, that *all* motion, but more especially that of heat and life,* tends to propagate itself. It appears that when an iron nail has *once* been heated red hot by hammering, the smith cannot make it so again till he has made it red hot by putting it in the fire, and suffering it to cool. It has hence been inferred that heat is a *material* imponderable, and that the fire *communicated* to the iron what it had lost by hammering.

It is certain however, that as the iron used for this *re*-hammering has again become *cold*, no actual communication of heat, REMAINING AS SUCH, seems probable. An "*ether*" may be communicated that again separates the atoms of the iron (*as this probably occupies a greater bulk again?*), but then we must suppose this "ether" can be *transmuted* into heat by hammering, or that the atoms of the iron being again separated, and thus being made *capable of moving more freely* when hammering goes on, can by this MOTION again produce heat.

If it be possible to convert electricity or light (or chemical affinity) into heat, perhaps the former of these theories is the more probable; and lately an experimentalist has attempted to show such generalization by voltaic electricity. On the whole, I incline to this theory; for as the *atoms* of the iron are still united by the cohesive force (the bar used being a solid mass), I cannot conceive them as having acquired by heating more than a *very limited* power of motion. In many cases of chemical affinity the *rapidity of motion* no doubt seems to produce the great heat; but here the iron is in the state of *filings*, and consequently, as we may suppose, more in a condition to move quickly.

However, as we observe *solid* iron wire to burn in oxygen gas in consequence of the strength of chemical affinity, the probability here seems that "ether" between the particles of iron is set *in rapid motion*, and, according to the first of the two theories, actually *converted into heat*. Or, to take only another seemingly possible theory, some little heat has been communicated to the iron by re-heating,* and this *has a power of reproducing itself under certain circumstances*, as we seem to see in the IMMENSE QUANTITY *of heat* produced in some cases of combustion.

But as it is certain from the experiments of Pictet and Biot (Thomson, *On Heat*, pp. 286-7) that "increase in specific gravity is proportional to heat given out," and that there is less condensation after the second blow given to a metal than after the first, we must refer the capability of iron to give out heat again after being put in the fire to a change in molecular arrangement (viz., a *further* separation of atoms). Now, as we cannot conceive that these *atoms themselves* are increased *in bulk*, this change can only be the addition of heat or ether *between them*. Heat has certainly been added, and if we conceive this to have an innate power, like life, of generating itself, we can account for the great quantity of it given out, when so very little, *judging from the metal in its cold state*, seems to have been added.

* This power of sympathy, or *generating its like*, is just as certain in nutrition, as in propagation strictly so called. For in nutrition the *same sort of* motion is communicated to dead organic matter, as exists in the living body that uses this dead matter for food—in other words, it is made *alive*.

One of the great mysteries in organic nature is not only why all species should propagate, but *why* each should propagate *its like*. But if, as I have endeavoured to show in my "Essay on Fermentation and Putrefaction," *Mech. Mag.*, vol. lxiii., 1855, the different kinds of motion tend only to propagate *like* kinds, on this view the *form* of young plants and animals should be like that of the parents, for they consist of the AGGREGATE of like motions. Besides, above I have called it (motion) a *sympathetic* power; but the very nature of such is to propagate *only* its like. These hints should be followed up by experiments on ALL *KINDS of* motion.

* This process may, however, probably have altered the *molecular structure* of the iron, as the advocates of heat being merely a property of matter will, no doubt, assert.

But as the metal seems to require to be heated to redness before it will give out much heat again, a great deal *has been* added; though, looking at the metal when cold, it *seems* again to have lost it. It has, however, certainly not lost it *all* again when it has grown cold (as its increase in bulk will convince us). Hammer again, and you produce condensation, and thus compel this small quantity to reproduce itself during the act of expelling it by force from the metal. "When metals can no longer be condensed they cease to evolve heat," says Thomson (287); and as by his tables it seems that copper gives out a vast deal more heat than silver or gold by percussion, we may probably infer that in a *natural* state its atoms are always much further asunder; accordingly we find its density only 8·95, while that of silver is 10·5. However, it is clear that this theory will only hold to a very limited extent, since silver and gold increase nearly equally in specific gravity when struck; and though gold evolves less heat than silver on being struck, yet the difference is not at all in proportion to specific gravity, that of gold being as high as 19·23. Hence there is clearly an innate difference in the *very atoms* of these different metals; contrary to what some of our *modern* alchemysts are beginning *again* to conceive.

It appears that malleability and ductility are destroyed by hammering; and, to restore these, the metals, after being again heated, *must be allowed to cool slowly* (Thomson, p. 175). This is in favour of the metal acquiring a fresh stock of heat, *gradually*, by such "annealing," as it is called. Dr. Thomson also says, "If, in annealing, no FOREIGN heat was ADDED, there is no reason why iron which has been heated to redness by hammering should require annealing; for *it is already as hot as is required by the annealing process.*" It is also worthy of remark, that the specific gravity of gold and silver, after annealing, is diminished (see Thomson's Tables, 287.) This seems to show that they have absorbed an *extra portion* of what Thomson justly calls "latent heat," and which Thomson has not *at all* alluded to at p. 287, and probably not at p. 175: for in the above quotation, though he justly infers the heat substracted must be *added again*, he says nothing about an *extra proportion* of it, as Pictet's Tables would lead us to believe.

Whether the heat added is or is not changed to "ether," we can never tell. I therefore prefer the theory which considers heat as simply added in somewhat *extra proportion, but which heat, like all heat, has a power of reproducing itself.*

Previous to any remarks on "images," I propose to say in reference to the disputed point, whether the rays of the sun producing heat and chemical action, should be regarded as the same as those producing light, that as Mr. Stokes (*Phil. Trans.*, 1852) seems to have rendered some of these so-called dark rays visible by making them pass into a solution of sulphate of quinine, he adopts the opinion that all the above rays are effects of the same cause. Becquérel and Melloni also had previously considered them different conditions of one power, because all these different rays agree in their *general* properties,* and because, though chemical action is, generally speaking, most intense at the violet end, yet this depends much on the nature of the substances, some *slight degree* of chemical action on some substances being perceptible all through the spectrum.

And when we take all the above circumstances into consideration, and also the fact of the "convertibility" of heat into light (Thomson *On Heat*), and also occasionally into electricity, I think this is the better view to adopt until the opponents shall *prove* (which they have not yet done), the totally distinct nature of the light, heat, and chemical rays. The probability seems that these are but *modifications* of each other, and probably in *particular circumstances* "convertible" into each other. If Professor Stokes has made the chemical rays *visible*, what else is this than causing them, by *passing through certain media*, to be "converted" into actual light? In like way, the most luminous rays, in passing through such media, are said to have been made to act chemically, or, as I call it, "converted."

That *all* solar rays act chemically on *some* preparations, the following facts evince:—On benzoate of oxide of silver the *most* refrangible rays act as the least refrangible generally do on other substances. The *invisible* chemical rays do not seem to act on it.

On nitrate of silver, protocyanide of potassium, and gold, the *maximum* action is said to be on the verge of the green rays, but extends to the very centre of the yellow, or non-chemical and *purely luminous rays.*

Nitro-muriate of platinum and lime water. Chemical action of this "commences at the same time in the extreme yellow and blue rays, gradually going on to the violet, but is confined, or nearly so, to the *visible* spectrum." Here again, then, the dark so *called purely chemical* rays seem to effect no changes whatever.

* For instance, "the so called chemical like the luminous rays, are capable of reflection, double refraction, polarization, and interference; and the spectra of these different radiations have the same lines."—(E. BECQUEREL, *Annales de Chemie. Nov.* 1843.)

Guaiacum. Dr. Wollaston concluded that the violet rays deoxygenized, and that the red oxygenized in this case, in consequence of the heat they contained. Sir J. Herschel has since proved that the red rays oxygenize guaiacum, but not from the greater heat they contain. (*Phil. Trans.*, 1842.) This is a most important fact in reference to this inquiry; for the advocates for PERFECTLY DISTINCT powers, heat, light, and chemical force in the solar rays, often make the *entirely gratuitous* assumption that when the red rays act chemically, they do so only from the greater amount of heat they contain. Sir J. Herschel, then, has the honour of having proved that in SOME solutions or compounds the red rays can act as truly chemically as the so-called *actinic* (chemical) rays. Indeed Sir J. Herschel (*Phil. Trans.*, 1840), has proved that the red rays increase in some instances the oxidation of a silver salt, and even prevent the darkening of paper covered with chloride of silver. Dr. Draper (*Phil. Mag.*, 1846,) further proves that the red ray even *reverses* sometimes the action of the other rays.

"Chlorophyl is admitted to be deoxydized by the *yellow* ray; and nitrate of silver, combined with *unstable organic compounds*, blackens under *every* spectral ray." This fact shows that chemical action is only *most* at the violet, but exists more or less in all rays.

Melloni has endeavoured to explain this unequal chemical action of the rays, by what he calls "chemical coloration," by which he seems to mean that each particular ray has most chemical action, or at least *attraction* * for bodies that have the same colour as itself. Thus coloured glasses or fluids allow the passage of a larger proportion of *rays of their own colour*, than of any others; and "if the spectral image is received on red ground, all the rays *will suffer diminution in intensity*, except the red, which will be *exalted*, and the same with other rays. Thus also if the red ray falls on a red colour, it increases the redness, and the same with other rays. Again, if the spectrum is received through ruby glass, or certain solutions of carmine, all the rays above the orange will be cut off."

Thus it seems well made out by Melloni that fluids and glasses let rays of their own colour pass, but for the most part absorb all the other coloured rays. It is clear, however, from Melloni's experiments, that some other rays pass such coloured glasses, though they do not appear to the eye *as coloured*. Thus, the rays of *white* light, and chemical rays pass more or less, or are "converted" into rays of heat; for Melloni's experiments show that these heat rays pass even through "deep violet glass" in at *least* equal proportion to what they do through "deep red glass," since through this out of 100 parts only 33 passed, while through "deep violet" 34 passed; and through "brilliant yellow" 22, and through colourless glass 40. (Thomson *On Heat*, &c., p. 134, Bailliére.) These experiments, made with such great accuracy, will at once render totally inconclusive all those experiments on Möser's images, (to which I shall have occasion to allude presently) made by using red glass, on *the presumption that this lets most heat pass*; and hence, that such images are caused by heat. The only discovery of importance on the subject of images generally, after Möser's, seems to me that of M. E. Becquérel, and it relates to DAGUERRE'S images. If the plate be taken from the camera, before it has been exposed sufficiently long to give a visible picture, or anything beyond the faintest outline, the process may be *continued* by putting the plate in the sunshine under a *red* glass. Now, this is clearly due to some *chemical* action in these red rays, independent of their heat, and Becquérel has properly called them *rayons continuateurs*. Professor Draper has rather objected to this name, and says, "if the phenomenon were due to an unequal action (as Becquérel supposes) of the same kind in different rays, the final result should depend on the time of exposure: the *red* ray, aided by daylight, should *solarise* (blacken) its portion *at last*; but this, in the largest exposure, never takes place." The reader should know that if the prepared plate be exposed *long* to the sun in the camera, it is *blackened*, and a *negative* picture only is formed; not so, if *red* glass be interposed. Professor Draper is then right in saying that the red rays passing through the red glass in question, must have a *different* action from the rays in general, since these will *at last* blacken it. If, then, Becquérel intended to say that his *rayons continuateurs* had the *same* action as the "exciting" (commencing) rays, he is certainly wrong; but as rays which *have* only the power of continuing action seem almost *necessarily* of a *different* kind from those

* This view makes a property analogous to "cohesion" to exist in light. *Like* atoms of light, attract like atoms, just as in *ponderable matter*. It also seems to imply a sort of *perception of colour*, very *similar* (I will not venture to say identical) to that of the retina itself. But, in fact, cohesion, chemical affinity, &c., &c., imply perception *in this sense*. (Is this property only *exalted* in living matter?) When we find that touching fluid phosphorus or sulphur with a metal wire, or admitting air to a *saturated* solution of sulphate of soda produces almost instantaneous solidification or crystallization, we find it next to impossible to distinguish between the physical and metaphysical—between loss of heat, pressure, &c., and sensation —*at least, sui generis*.

which *only* have the power of *commencing* it, probably Becquérel meant only that the red rays in this case acted chemically, and not by their heat; in which opinion he seems right, and which opinion, though it has been opposed, has, wisely not, that I see, been opposed by Professor Draper.

Shortly after Becquérel made the above discovery, M. Gaudin proved that if the plate as above be placed beneath a *yellow* glass, *the image is developed without the application of mercurial vapour.*

If Becquérel, therefore, uses the above-named terms to convey the idea that there is almost always *opposite* action—sometimes chemical, sometimes electrical—in the rays at the opposite ends of the spectrum, I think he uses it in a correct sense. I have already alluded in general terms to this opposite chemical action; and recent experiments show that the rays at one end deflect a very delicate galvanometer in one way, and at the other end in an opposite way.* Certainly, looking at the spectrum, there seem to be *innate* differences in the sum of the rays we call light; but we must not forget that it has been proved that the *composition* of the prism itself changes the *greatest heat point* of the spectrum; thus, Lubeck shows, when this is of water, such point is in the yellow rays; when of crown glass, in the *middle* of the red; and when of flint glass, *beyond* the red.

Now, this seems to show, that although it has been usual to consider certain rays (the red) as having *innately* greater heating power than others, such conclusion is scarcely legitimate. The MATTER of the prism seems to have an affinity for light that passes through it, different according to the nature of this matter; just as with chemical affinity between *ponderable atoms* of matter. Light is thus "*decomposed*," and unites, or at least is *modified differently* in its passage through such prism, according to the *matter* of such prism. As, however, it is rather the way in which light falls on the prism (viz., obliquely) than the matter of the prism that causes the spectrum, decomposition is clearly only in a small degree due to chemical affinity of the light. But still, as the light seems certainly (to use the common language on this point) decomposed, does it seem right to regard rays at the opposite ends of the spectrum as really different in nature as the potassium and oxygen which form potass? Perhaps so; and this view will apply to the invisible rays *beyond* the spectrum still more forcibly, for *they* have been so much more changed by this decomposition, as to have *altogether* lost the very obvious character of light (its *visibility*), though they retain most of its other properties. But as the greatest heat point in the spectrum may be changed, so it is stated recently that its chemical power may be transferred* to its greatest light power, when we make the light pass through orange glass (containing silver); or through uranium, canary yellow glass (toilet-bottle glass) an inch thick, up to about 2½ inches, this difference in thickness scarcely diminishing the chemical action that goes on in the luminous part of the spectrum, from the yellow up to the blue. It is stated that in this case also no chemical action occurs in the extreme violet, nor a little beyond it. In this case, however, as with orange glass above mentioned, when much beyond the *visible* spectrum a spot of slight chemical action appears. So that as regards transferring chemical action, these glasses appear nearly to agree.

The latter, however, seems rather to alter the colour of the blue and violet rays than actually *to cut them off* by absorption. Its peculiarity (like that of sulphate of quinine, 1 part to 200 of acidulated water) is, that it makes a green dispersed light appear *beyond* the spectrum ("makes the chemical rays visible.") Solution of sulphate of quinine also cuts off (absorbs) the violet ray, like orange glass. It is generally considered, too, that, like the above glasses, it renders the chemical rays inactive. It certainly does on bromide of silver; but, according to some recent experiments, it has not, commonly speaking, this effect in so marked a degree as uranium glass. The general principle, however, appears to hold, that when a glass or solution absorbs or cuts off the violet rays from the spectrum, chemical power is transferred to the luminous rays. More experiments are wanting on this subject; and Becquérel, when he discovered that a *yellow* glass acts like the vapour of mercury,†

* Becquérel proved also while phosphorescence was excited by the most refrangible rays, it was destroyed by the least refrangible. (Also Lubeck.) And when in Sir Isaac Newton's experiment *two* prisms are put together so as to form a *square* of glass, although the coloured spectrum is then transferred in the shape of a white spot of light to the floor, yet even this is not like chemical synthesis, for in such case the light may be said *never to have been* "*decomposed.*" Newton could not, by changing the place of the spectrum, by *one* prism only, make it look other than an indistinct mass of colour.

* I say "transferred," because the blue and violet (chemical rays) are absorbed by this glass, thus *they do not appear on the spectrum.* The *light* of the rays seems to remain much the same, so that light is not in this case *converted* into chemical force.

† Those who advocate that light and chemical action of the sun are *perfectly distinct* (hence of course non-convertible) powers, do not get over this fact. They are obliged to admit *action* by the light rays, yet call it light and heat action, any-

may be said to have discovered the supposed new fact they set forth.

It is right to state that Mr. Stokes (whose recent discoveries lead him also to believe in the undulatory theory of light) thinks that the green colour is given to uranium glass, and the blue to sulphate of quinine solution, and also to decoction of horse chesnut bark, as well as the purple to green fluor spar, by *an alteration in the refrangibility of the rays*. On this view certain *colours* will be attached to rays of a certain refrangibility, or, in other words, rays DECOMPOSED by certain agencies; for it clearly appears that *some* prisms and *some* solutions decompose the rays in a particular manner, or, in fact, CONVERT them into rays that may be SEEN. I should apprehend the quinine solution, &c., make extra rays visible rather by the colour attached to them than by increasing their refrangibility; for though these "fluorescent rays" appear beyond, and consequently as more refrangible than the violet, yet chemical experiments had previously shown that such MOST refrangible rays existed there, though previously invisible.

(*To be concluded in our next.*)

VULCANIZATION OF INDIA-RUBBER.

No. I.

THE vast importance that the discovery of vulcanizing India-rubber is assuming, not alone through the continent of America, but the whole of civilized Europe, has determined us to give a series of articles upon the subject, which we are inclined to believe will be of peculiar interest, from the fact that their substance is derived from sources upon which implicit reliance may be placed.

The history of the early struggles of inventors carry with them their romance and their moral. Those of Mr. Charles Goodyear, a native of America, would furnish a novelist with ample material for a three volume work of "deep and thrilling interest;" and whenever he may be pleased to publish his life, and the detail of his discoveries, which it is said he has long had in the press, the old adage, that "truth is stranger than fiction," will receive another corroboration.

As our pen, however, will be more engaged in the description of the science than of the individual himself, we had first better explain, for the benefit of those yet uninformed upon the subject, what "vulcanization" really consists of.

It is well known that India-rubber or gum elastic loses its power of elasticity after being subjected a certain period to tension; that during hot weather it melts and runs and becomes adhesive, and that in cold weather it assumes an obstinate hardness, with an absence, more or less, of its pliability. That, in fact, it is changeable and coquettish, according to the rise or fall of the barometer, and that for any purposes of usefulness it could only be relied upon during the continuance of certain and narrowly proscribed degrees of temperature.

The India-rubber mania, in the United States, was at its highest in 1836, and vast sums of money were invested in mills and plants for its conversion into articles of commerce. The discovery that these articles were subject to the influences of the seasons fell like a thunderbolt amidst all classes—for all classes, more or less, as in the period of our railway mania, held stock in the leviathan speculation, and had an interest in its success. A frightful panic was the consequence. The "stock" fell below zero. Mills were abandoned as pest-houses, and hundreds of thousands of tons of India-rubber, either raw or prepared, were thrown upon a market that repudiated it. This once immense capital became literally valueless, and without an owner; and like the ill-omened vessel in the farce of the "Bottle Imp," no one would purchase it, even if paid for buying. This vast field of enterprise, which was as yesterday employing millions of dollars and thousands of artizans, was deserted, and all men, with one accord, tacitly agreed to let all connected with it sink into oblivion, if it were possible.

It was now that Mr. Goodyear, looking around upon this boundless wreck, determined, at all hazards, to save as salvage at least the greater part, if not the whole of that, the loss of which he truly considered a great national misfortune. In this he stood perfectly alone. The obloquy inseparable to the merest attachment to India-rubber removed from him all sympathy, excepting that negative description which looked upon its object as a man demented. But firmly impressed with the presentiment that nature did not play practical jokes with her votaries, and would scarcely lead the mind of her devotees so far as she had done into the merits of India-rubber, unless it possessed additional qualities, either innate or conjoint with other substances, of value to mankind, he determined to take the fact for granted, in despite of all entreaty, derisive opposition, and even of opprobrium, and give his life's labour entirely to the service of gum elastic.

The hardships, the privations, and even

thing but what it is, namely, *indisputable chemical action of some sort.*

the imprisonments, from poverty, consequent upon this devotedness seem but to have inspired Goodyear with additional energy. "Seek, and ye shall find," seemed to be constantly whispered in the stillness or bustle of the atmosphere, and every day and every hour he awaited and was ready to receive, without surprise, the mental messenger that should cry "Eureka." That day at length dawned, after very many failures, and several minor but important discoveries. The employment of sulphur admixed with the gum, and a heat of some 270 degrees, gave to the world the subjection of India-rubber to countless purposes of mankind. To enumerate the advantages and properties thus secured will be to state, to some extent, what gum elastic did not previously possess. Amongst these are elasticity perpetuated; resistance to change from exposure either to cold, to the sun's rays, or to extreme heat; elasticity under compression; and durability in a remarkable degree, almost amounting to unchangeableness by time, whether kept wet or in a dry state; resistance to the attacks of moth or vermin of any kind; its power of resisting solvents and all destructive chemical agents for a length of time; its unalterability; its inadhesiveness; its impermeability to air, gases, and liquids; its plasticity; its facilities for ornamentation by painting, bronzing, gilding, japanning, and mixing with colours; and its non-electric quality. Moreover, the vulcanised India-rubber is freed, to a very great extent, from the offensive odour of the native gum.

In our next article we shall be prepared to enter into the details of these several qualities, as they each and all bear upon some particular or general ramification, which is again split up into indefinite channels of usefulness in the arts or manufactures.

THOMPSON'S SHIPS' KEELSONS.

MR. J. THOMPSON, of Sunderland, has recently patented an improvement in ships' keelsons, more particularly intended for timber-built ships, but which may also be applied when building iron ships; and the object is to get greater strength in constructing the keelsons. For these purposes the keelson is composed of plates of sheet iron on edge, or of angle iron, in combination with pieces of timber, the iron and the timber being bolted together horizontally by bolts, and the keelson bolted to the keel as heretofore, the bolts or fastenings which fix the keelson to the keel passing by preference through the timber of which the keelson is partly made. The arrangement and number

Fig. 1.

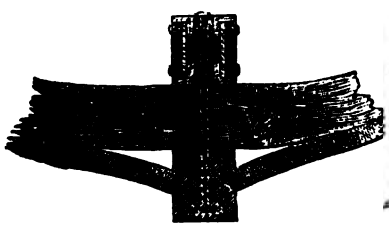
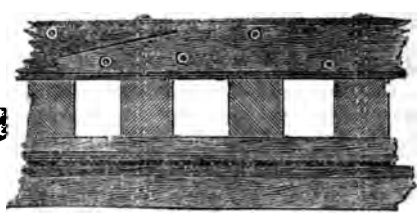


Fig. 2.



of plates of iron and of angle iron may be varied, as is also the case in respect to the pieces of timber combined therewith; and where the several pieces of timber are scarfed, it is desirable that the scarfs of the different longitudinal pieces of timber should be at a distance from each other, or what is called "break joint."

Fig. 1 shows so much of a transverse section of a ship or vessel as is required to show the application and construction of the keelson according to this invention; fig. 2 shows a longitudinal section of a small portion of a ship or vessel, with the keelson fitted thereto.

MR. BESSEMER'S DISCOVERY.

THE very general and intense interest excited by what has been made public respecting Mr. Bessemer's invention, by no means diminishes; nor has Mr. Sanderson's article in our last number failed to add fresh fuel to the fire of the public excitement. We believe the only just and faithful course that can be taken at present in the matter, by scientific journalists, is that of abstaining from speculative statements of their own, and recording such facts as come to their knowledge.

During the present week, we have had intercourse, personally and by letter, with many persons whose opinions are of great importance, and while we are delighted to state that good grounds exist for full faith in the great value of Mr. Bessemer's invention, we are nevertheless bound to acknowledge that Mr. Sanderson is by no means the only experienced person who dissents strongly from the popular estimate of it.

We have in hand letters upon the subject from Mr. Mushet, Mr. Green, and many other gentlemen, but this week we think it unnecessary to publish more than the following paper from a gentleman who is well-known and highly esteemed for his acquaintance with matters of practical science.

"Some doubts having been thrown on the fact of Mr. Bessemer's process producing malleable iron, I went to witness it last Monday. At the experiment at old Richard Baxter's whilome domicile, one amongst the gazers from the iron districts—a stout, wealthy-looking, growling individual, with a spice of the St. Thomas in him—thought the casting too hot to try with his fingers, but expressed his belief that it was not malleable, but simply cast iron. On this, Mr. Bessemer spoke not, but entering the shed, returned with a large axe, thick on the edge, wherewith he 'laid on load!' Two cuts at the edge of the ingot left the impression in indents analogous to those produced in chopping a wooden post. 'That's not cast iron!' growled some one else, as though wishing it had been; and the Staffordshire iron chieftain, Mr. Blackwell, possessing himself of a piece, subjected it to cold hammering on the anvil, and subsequently to filing in the vice, the file hanging to it as to tough copper. 'We must change our proceedings,' were the remarks in result, 'whether by this process or some other not yet known; it is clear that we cannot go on as we have done.'

"The whole matter is so clear that the obtusest of iron brains may predict the result. The existing blast furnaces of the iron makers, with a functional alteration, are now competent to turn out the malleable iron ready for the hammer or the rolls. The present line of tuyeres is made to operate upon the charge of ore, lime, and coal, just above the level at which the molten iron stands. A second line of tuyeres, with fire-clay nozzles applied at the bottom level of the molten iron, will purify the iron as fast as it melts, and the increased heat thereby generated will go to aid the reduction of the ore, and there seems to be no reason why the process should not go on as long as the furnace will endure.

"Mr. Bessemer's patent is original and sound, and his huge revenue will arise from a huge benefit conferred by him on general humanity. He is the first man to point out the mode of holding molten iron in a clay colander, sifting metal from its impurities at a white heat.

"W. B. A."

THE TRIALS OF REAPING MACHINES AT BOXTED LODGE.*

THE judges awarded to Mr. Alfred Crosskill the sum of 20*l.* for his Improved Bell-M'Cormick Reaping Machine. (We are surprised to observe that this reaper is referred to by all our contemporaries as "Crosskill's Improved Bell's Machine," without any reference to the name of Mr. M'Cormick, to whom it owes much of its merit.) To Messrs. Burgess and Key the sum of 15*l.*, for their "Improved M'Cormick's Reaping Machine." To Mr. Wm. Dray the sum of 15*l.*, for his "Improved Hussey's Reaper." From the result of these trials, the judges regret to observe that very little improvement has been made in this

* The exigencies of publication have compelled us to defer the insertion of this notice for two successive weeks.

class of machines since last year. They consider that for general harvest purposes, the machines of Mr. Crosskill and Messrs. Burgess and Key are to be preferred; but for reaping only, they think Mr. Dray's decidedly the best machine.

THE MOON'S MOTION.

THE Review of Herr Von Gumpach's work on the rotation of the moon, published in our Magazine for August 23rd, has brought in upon us a flood of letters, either one of which is probably sufficient (in its author's estimation) to overwhelm us. Mr. Jelinger Symons, Mr. Evan Hopkins, Herr Von Gumpach—all these have rolled the torrent which many lesser tributaries have conspired to swell far beyond the limits of our space, and indeed beyond the limits which could be found for them in any wisely-conducted scientific journal.

The true nature of the moon's motion has been so frequently expounded in our pages, by correspondents whose names, if they were made public, would command respect, that we need now do no more than offer such observations and suggestions as may occur to us on the perusal of the letters which we find it necessary to lay before our readers.

Mr. J. Symons, whose letter in the *Times* of April 9, originated the recent elaborate controversy in that journal, writes as follows:

To the Editor of the Mechanics' Magazine.

SIR,—As you have inserted several letters and papers against the theory of lunar motion, which I have humbly endeavoured to support, in which it has been variously misconceived, I trust you will insert the following brief abstract of what I have held on this simple subject. It is all that I deem requisite to establish our view of the matter.

More than half a century ago, Barlow—no mean authority—gave this definition of rotation:

"*Rotation;* the motion of the different parts of a solid body about an axis, called the *axis of* rotation, being thus distinguished from the progressive motion of a body about some distant point or centre: thus the diurnal motion of the earth is a motion of rotation, but its annual motion one of revolution."

* * * *

"When a solid body turns round an axis, retaining its shape and dimensions unaltered, every particle is actually describing a circle round this axis, which axis passes through the centre of the circle, and is perpendicular to its plane."

According to this definition, the moon unquestionably does not rotate. All points in her form concentric rings round the centre of her orbit. No point in her forms a ring round her own centre; yet this is a necessary condition of rotation, not only according to Barlow, but to every acceptation of the term. There is demonstrably but one movement in the moon's motion round the earth; for immediately that described by Barlow (and known to all mankind except modern astronomers as rotation) be superadded, she presents a different face to the earth. Now, the older astronomers, who wrote when Barlow's definition of rotation was alone accepted, clearly and palpably blundered in stating that the moon had two motions; namely, her orbital revolution, plus one rotation round her own axis. Moreover, her own axis or centre has no more relation to her motion than any other point in her; each point moving round the distant centre of her orbit, with angular velocities proportioned to their distance from it. This, Dr. Lardner has elaborately demonstrated, instead of proving rotation;—a motion from which this geometrical property, among others, obviously distinguishes lunar revolution.

Mathematicians and modern astronomers now attempt to reconcile the dogma of their predecessors with the facts, by adopting De Poinsot's vague and incorrect definition of rotation, used by one of your correspondents in your last Magazine, and which would make every motion of translation (except in a straight line) one of rotation. This is, however, but a lame device; for the astronomical book writers are nailed to two separate motions, the one *in addition* to the other. This is not the fact; and being not the fact, I have not the slightest doubt of the ultimate establishment of the truth, against any arbitrary dogma to the contrary.

I am amused at your imputing differences amongst us, when not a letter is written on the opposite side without some point blank contradiction to the dicta of some other astronomer; especially those of the Astronomer Royal.

I am, Sir, yours, &c.,
J. SYMONS.

P.S.—I heartily rejoice in the sneers and abuse; they have done us good service.

Council Office, Downing-street,
Aug. 26, 1856.

Without stopping to inquire into the nature of those remarkable "points" which are said to "*form* rings," we at once observe that Mr. Symons' strength lies mainly in assertion. Having quoted Barlow, instead of demonstrating something to his

purpose, he says loftily, "According to this definition the moon does not rotate," and attempts to support this assertion by a number of others equally arbitrary and equally mistaken, such as "No point in her (the moon) forms a ring round her own centre;" or, to put the idea of the author into English, if we may take that liberty, "No point in her (the moon) describes a circle round her axis." If Mr. Symons *could* imagine the *translatory* motion of the moon to be destroyed for a time, and the moon to continue to present the same hemisphere successively to different points in the heavens, as she now does, he would then understand why each point in her (except points in her axis) is said to describe a circle about her axis, although it at the same time describes a circle about the centre of her orbit.

We really cannot believe it necessary for us to follow Mr. Symons through all that he writes,—breaking every bubble as he blows it,—although the task would require much less science than patience to do it effectually.

Mr. Symons is "amused" at our imputing differences amongst him and his co-theorists, "when not a letter is written on the opposite side without some point-blank contradiction to the dicta of some other astronomer." If Mr. Symons can persuade himself that the "point-blank contradictions" mentioned exist, and can at the same time derive amusement from his persuasion, we are not disposed to interfere with his innocent gratification.

Mr. Symons heartily rejoices "in the sneers and abuse." He does not tell us what "sneers and abuse" he alludes to; but as they have done him "good service" we are content to remain ignorant of this. Our only fear is that he has but little beside the sneers and abuse of his opponents to build his cause upon.

Before laying Herr Von Gumpach's letter before our readers, we must bespeak their charitable consideration both for the writer and for ourselves; for him, because he fancies himself an injured author; for ourselves, because we have a double temptation to publish it—first, a desire to accord to him an opportunity to explain or defend himself; secondly, a desire that our judgment of his book should be confirmed by his rejoinder. He writes as follows:

To the Editor of the Mechanics' Magazine.

Sir,—My attention has been drawn to a notice of my recently published Essay on the "Moon's Rotation," in the last number of the *Mechanics' Magazine*. Were it not that the scientific character of your excellent Journal lends its weight to that notice, or had the reviewer merely pronounced me to be shallow, heretical, mystical, foolish, simple, fanciful, presumptuous, unintelligible, &c., I should have deemed his observations unworthy of a remark; for abuse, opposed to argument and proof, is little calculated to affect either. But, as an alternative of inability and shallowness, he brings the charge of disingenuousness and want of candour against me; more ingeniously than candidly enforcing that alternative, by concluding his notice with a moral reflection on my "squandered talents." *A most perfect ignorance of the real merits of the Newtonian theory of the Moon's Rotation, as explanatory of her libration, and a series of wilful misrepresentations and statements in diametrical opposition to the truth, on the part of the reviewer, are the sole grounds, on which he makes his imputation to rest.*•

One example will suffice to characterize these misrepresentations and to show the spirit, which has dictated the "review." According to the writer, my Essay contains such unintelligible expressions as these: "In which the points, A B C, shall indicate the direction of the corresponding points, *a b c*, in the axle." "The points, *a b c*, in the axle, will maintain the same direction, and continue to regard the corresponding points, A B C." Now, my words, accompanied by the diagram to which they refer and which serves to illustrate them, are these: "Let W, in fig. 1, represent the wheel [previously alluded to] rotating on its fixed axis A; S S′ a portion of space *in which the points* A B C *shall indicate the direction of the corresponding points a b c in the axle*—being the axis of rotation—as well as the direction of the points *a b c* in the circumference of the wheel, before it is put into motion. Then, being put into motion, *the points a b c in the axle will maintain the same direction and continue to regard the corresponding points* A B C in space; but the points *a b c* in the circumference of (and any other points in) the wheel will change their direction, both with regard to space and to the axis of rotation," &c.; my object being to show that it is a change of direction, not only with regard to space [as is usually assumed], but both with regard to space and to the axis of rotation, which determines the rotatory motion of the wheel. The *bits* of sentences, printed in italics, as the reader will remark, have been designedly torn out of their syntactic connection, and falsely represented by the reviewer as *perfect* sentences, occurring in my Essay. Such is a specimen of the practices to which he does not scruple to resort, in order to expose me

• The italics throughout this letter are the writer's own.—Ed. M. M.

to the "derision of the public." They are as contemptible as they are discreditable, and could hardly fail to seriously affect the character and position of any scientific journal, were they for one moment countenanced by its editor.

The utter misconception of the merits of the question of the "Moon's Rotation," under which the reviewer labours in common with the majority of astronomical writers of the present day, arises from his applying the modern (erroneous) sense, attached to the term "rotation"—*a sense which was not thought of by Sir Isaac Newton, and has only in more recent times been introduced into science*—to the Newtonian theory *of which it is destructive*, without taking the trouble of acquainting himself even in the most superficial manner with the real bearings of the latter. Hence, in the plenitude of his ignorance, he declares the very view held by Newton and all the most eminent astronomers who had since adopted and *comprehended* his theory, to be "absurd," at the same time that he defends that theory, having all the while no more idea of it than "the man in the moon" himself. He supposes the author of the "Principia" capable of having ascribed to the same identical motion of the lunar globe two differing *simultaneous* rates of velocity, and men like Kepler and Galileo to have denied an "apparent [obvious] fact." Suppositions of this kind betray something more than *shallowness* and *simplicity*, and fully prepare us for the reviewer's distinct statement to the effect, that the unrestrained wheel of a carriage in motion does *not* rotate, but that with a brake attached to it, it *does*. He acts prudently, at least, in not so much as attempting to touch upon the "many investigations of much pretension," which he allows my Essay to contain; bearing in mind, no doubt, the well-known maxim, "*Ne sutor ultra crepidam.*"

I need hardly mention that the reviewer, when stating that I merely quote such authorities as Newton, Lagrange, Laplace, the Herschels, Humboldt, Kepler, &c., in order to correct them all, states that which he *must* have known to be contrary to the truth; and the same remark applies to his assertion that, with regard to Mr. Symons, Mr. Evan Hopkins, and Mr. Perigal, I do "not scruple, at times, to oppose every one of them." Mr. Symons, certainly, has as little comprehended the Problem in question as the reviewer has done; but for *his* misconception of it there existed a good excuse, and I expressly observe that he had "been *misled by astronomers themselves* to look upon the *general* fact of the moon's always turning the same face towards the earth, as the sole ground on which the theory of her rotation rests; whereas that fact is only one incidental to the theory." For "strange and almost incredible as it may appear," I had remarked in an earlier place, "it is nevertheless the simple truth, that the real merits of the problem of the 'Moon's Rotation' have been as little comprehended, generally, by the learned as the unlearned, *and that Sir Isaac Newton's proposition relative to it has been entirely misunderstood by the far greater majority of his own followers in science.* The author of the 'Principia,' finding that, under the assumption of the moon's uniform rotation on her axis in the precise time of her periodic revolution, and of an inclination of her axis of rotation to the plane of the ecliptic, her librations might be accounted for in a more perfect manner than had then been attempted, he, pointing to the analogy of the rotation of the sun and the planets, *asserted the fact*, and then stated its necessary consequence to be, that the moon must always turn nearly the same face towards the earth. *But this proposition has since been exactly reversed.* The moon always presenting the same face towards the earth: —*thence*, we now hear it generally argued, it follows of necessity that she must rotate on her axis, *just as though one person had advanced the proposition that man, being a living thing, had consequently motion, and another person were to argue from it that a living thing, having motion, must consequently be a man.* And the worst is that, in its *corrupt* form, the proposition is usually ascribed to Newton himself, and has thus usurped all the weight attaching to his immortal name."

Relying on your courtesy as well as on your sense of justice and fair play, to give insertion to these remarks in one of the next numbers of your Journal,

I am, Sir, yours, &c.,

August 29, 1856. JOH^N *v.* GUMPACH.

As to all that Herr Von Gumpach says about our "misrepresentations" of his words, we need only reply that our objections by no means depended upon the words quoted by us being considered "perfect sentences" (which we never intended they should be). We merely abstracted them from their "syntactic connection" to save time and space, and Herr Von Gumpach must indeed be short-sighted if he imagines that they are at all improved by being restored to their "syntactic connection." All that he says about "contemptible" and "discreditable" practices, we shall not, after this explanation (which no one but the author can require) reply to. Had it proceeded from the pen of an Englishman,

or been directed against any one but ourselves, it would not have been inserted.

The whole of the third paragraph of Herr Von Gumpach's letter is bluster, and we can only reply to his flourishes about Newton, Kepler, and Galileo, by saying that he either cannot or will not understand that the passage from the *Principia* quoted by him had practically nothing whatever to do with the question of the moon's rotation, as it now stands One part of this paragraph is, however, something much worse than bluster; for we there read of the "reviewer's distinct statement to the effect, that the unrestrained wheel of a carriage does not rotate, but that, with a brake attached to it, it does." We need scarcely say that, incredible as it would seem to some, no mention was made in our review of a wheel and a brake, or any such thing. Our readers will draw an obvious inference; they will do the same from what is about to follow.

The fourth paragraph of this curious letter opens thus:—"I need hardly mention that the reviewer, when stating that I merely quote such authorities as Newton, Lagrange, Laplace, the Herschels, Humboldt, Kepler, &c., in order to correct them all, states that which he *must* have known to be contrary to the truth." Now we did not state that he quoted those great men "*in order* to correct them," but that he made copious reference to them, *and* corrected them all. His own words will justify this statement of ours better than any of our own.

At page 50 of his book he says, the "moon's rotation, as proposed by Newton, is in reality little more than *a naked assertion;*" and adds, "Nor is this all. *The proposition embodies a three-fold fallacy.*" At page 51 he further adds, "So far, then, as the Newtonian proposition is based on its own demonstration of the moon's rotation on her axis, it is utterly untenable." Again, at page 110, "the analytical researches" of Lagrange, Laplace, and Poisson are thus referred to:—"What truths they contain, may be traced to the corresponding empirical elements thrown into that process [of analytical reasoning]; but its foundation being *an erroneous hypothesis*," &c. Again, at page 54, after alluding to a fact which he says proves the impossibility of the moon's rotation, the author adds, "Yet the fact alluded to has been simply advanced as *proof* of the moon's rotation by Laplace," &c. At page 68 we are informed that, "Most infelicitous also in his illustration is the immortal author of the *Mécanique Céleste;*" and again, on the same page, "The argument adduced by Laplace [in favour of the moon's rotation] is the strongest he could well have urged against the moon's rotation." And in this manner we might proceed to judge this author (who, we hope, has lost his memory) out of his own mouth in this matter.

In the same paragraph he flatly denies having opposed Mr. Symons, Mr. Hopkins, and Mr. Perigal. But what is the case? His remarks against Mr. Symons in his letter are no stronger than those in his book. At page 83 he says he "can but regret that Mr. Symons should so little have availed himself of that aid [rendered by many scientific supporters] as to show hardly a trace of it in his paper." At page 79 he quotes Mr. Evan Hopkins' letter, and adds, "all this is perfectly correct, except that *the question of the moon's rotation is not, as here implied, in any way dependent on the truth or error of the general arguments which have been urged either for or against her rotation.*" And as regards Mr. Perigal, this veracious writer says, at page 139, "it is only an assertion on his [Mr. Perigal's] part, which he does not support by any proof or argument," &c.

The rest of Herr Von Gumpach's nonsense we leave to produce its natural effect. All we feel disposed to add, after having taken the trouble to exhibit the character of his statements thus far, is that, however much he may rely upon our "courtesy" and "sense of justice and fair play," we shall not insert any further communication from him, unless it contrasts strongly with the preceding one, by being courteous, reasonable, and—to some extent, at least—truthful.

Mr. Evan Hopkins' criticisms upon Dr. Whewell's paper we must exclude, simply because we have not space for them. The same circumstance prevents our inserting other letters which have come to hand. The loss to our readers may be great; but they will, we are confident, sustain it nobly.

FOREIGN INTELLIGENCE.

MOVEABLE HOUSES.—The question of the dwellings of the *working* classes is one of the most vital of our present social revulsion. It is easy to demolish whole streets for erecting palaces thereon, but how to *place* the expelled is another question! *M. Seiler*, of Paris, one of the M.P.'s of the Swiss Republic, has started a new system of cheap domestic construction, which is making some impression in the French capital, and is likely to be extensively introduced. The *maisons mobiles* of M. Seiler are either constructed to contain only *one* family, at the *yearly* rent of 600 francs (£24), and in this case the accommodation is ample; or houses for *two* and *four* families, proportionally at the same rent, viz., 300 francs for the latter and 150 for the former, containing accommodation not to

be obtained under present circumstances. M. Seiler's system is that of the Swiss *châlet*. His houses are mostly built of wood, and said to be well ventilated, and at the same time warm. Of course, any locality, quite unproductive under any other circumstances, can be used for the erection of a *maison mobile*.

GOETHE, CARL AUGUST, OF WEIMAR, AND DÖBERREINER.—There has been published lately, the correspondence between these three persons; Goethe and the Grand Duke entertaining a communication of sixteen years' duration with Döberreiner, the chemist and architect—all for the benefiting of the land by improvements in the agricultural and industrial arts! (C'est tout comme chez nous.)

THE INFLUENCE OF CHEMICAL MANUFACTORIES ON VEGETATION.—The outcry which has been raised of late against chemical manufactories, that their effluvia and smell act deleterious on the surrounding vegetation, induced the Belgian Government to nominate a Commission to examine the truth and extent of that assertion. The results of their inquiries may be thus summed up briefly:—1. Chemical manufactories emit effluvia of acids, which are deleterious to the growth of some plants. 2. The area of this influence is not constant, but changeable. 3. The prevalence of certain winds extend the area of the influence of acids on vegetation, varying from 2,000 to 800 metres, the former being the maximum. The Commission proposes a number of preventions; for instance, the utter suppression of stone slabs in ovens, &c., for which we must refer our readers to the printed *Report* of the Commission.

SOUNDING OF THE ATLANTIC. — The United States Government have ordered a new expedition for the sake of sounding the depth of the Atlantic between Ireland and Newfoundland, where a submarine telegraph is to be established. Lieutenant Berrymann, Commander of the *Arctic*, U.S.N., has obtained the command of that expedition, who has already made similar observations in that sea. Mr. Berrymann is of opinion that the bed of the Atlantic shelves off towards the east, and it is for confirming that opinion that the present expedition is undertaken, on the results of which the line for the laying down of the electric cable will depend.

[*Communicated by* DR. J. LOTSKY.]

MR. BESSEMER'S INVENTION.

To the Editor of the Mechanics' Magazine.

SIR,—In your *Magazine* for the 26th of April last, page 402, you publish among your "specifications of patents recently filed" a description of a Mr. Martien's invention for "improvements in the manufacture of iron and steel," in the following terms:

"This invention has for its object the purifying iron when in the liquid state from a blast furnace, or from a refinery furnace, by means of atmospheric air . . . . . so as to rise up amongst and penetrate every part of the metal."

Now, if this is not precisely what Mr. Bessemer does, I am at a loss to know what that is, and if this is precisely what he does, I am equally at a loss to understand how the invention can possibly be his, and not Mr. Martien's. It is true, that Mr. Martien contemplated puddling the metal after its purification by the air, but I do not see that that can possibly deprive him of the sole right to use the means above described.

In a matter of such magnitude as the new process must be, providing your experienced correspondent, Mr. Sanderson, is not correct in his surmises, it is of great importance that manufacturers should take no false step in obtaining licences.

I am, Sir, yours, &c.,

A CAREFUL READER.

CONSTRUCTION OF ARCHES.

To the Editor of the Mechanics' Magazine.

SIR,—A friend, "F. P.," desires me to furnish some instruction for setting the key-stones in my plan of forming them.

A centre of the common form and construction should be employed, and whatever the shape of the arch, so should be the shape of the centre, save that part which is intended to come underneath the key-stone and the two arch-stones, or perhaps three, which are on either side of it. This part should be elevated, the degree of which, of course, will vary according to the size of key-stone, &c. In a semicircular-shaped arch, which I have described, it would take an oval form, while in an elliptical arch, of course this elevation would tend more to a semicircular form. When a centre of this sort has been made, the arch-stones should be placed in the usual manner, and the key-stone will then be found in a space larger than will contain it. It should be slid in sideways, and mortar should be placed on the under or bottom sides only, as well as only on the top or upper sides of the stone on either side of it.

Care should be taken that the mortar should be properly placed on the remaining arch stones (which are prevented from taking their natural slope by the elevation, or elevated part of the centre). When all is ready the centre can be removed, and the arch will assume its intended shape.

The mortar, of course, must be attended

to, so that it may not get dry or set, before the centre is removed, as obviously then (although the arch itself would stand without its aid), it would not be secure.

From the elevation, a greater sinking would be produced in this than in ordinary arches, as it is purposely at first thrown out of shape, to admit the key-stone properly, and to allow the mortar to be placed upon it in a right manner.

Hoping that I have satisfied now my friend, "F. P.,"

I am, Sir, yours, &c.,

J. A. D.

Reading.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

BENTALL, E. H. *Improved machinery for pulping turnips and other vegetable matters.* Dated Jan. 4, 1856. (No. 36.)

The patentee provides a cylinder, and fits in it rows of cutters, so arranged that the cutters of one row will act in lines intermediate of the cuts of the preceding; a moving cleaner is provided, which will remove any adhering pulp or extraneous matter from between the cutters.

WRIGHT, J. *Improvements in furnaces and fire-bars.* Dated Jan. 4, 1856. (No. 37.)

The object of the patentee has been the remedy of the defect of bars which have a reciprocating motion only, by the displacement of the bars from their vertical as well as their horizontal position, and he employs both these motions simultaneously for some purposes, causing the bars to rock to and fro, whilst for others he uses only the vertical displacement. By feeding pottery kilns, thinly and more frequently as you feed an ordinary furnace, fuel is economised, &c.

BOUSFIELD, G. T. *Improvements in the manufacture of Jacquard, piled, or terry fabrics, when parti-coloured yarns are used.* (A communication.) Dated Jan. 4, 1856. (No. 38.)

These improvements relate mainly to Brussels and Wilton carpets, and such other piled or terry fabrics as have their figures wrought from several sets of worsted, each set of a different colour from the others, and parts of each sets being from time to time brought to the surface of the cloth by the Jacquard machine to form the due proportion of the pattern. The object is to save worsted, that is to say, to produce a given number of colours in the pattern by a less number of sets of worsted in the cloth, or by the same number of sets of worsted in the cloth to produce a greater number of colours in the patterns.

BETTELEY, J. *An improvement in the rolling of iron for the making of ships' knees.* Dated Jan. 4, 1856. (No. 39.)

This invention consists in forming the grooves or surfaces of the rolls used in rolling knee iron, so as to produce one of the surfaces of each limb with a curved line or surface, at the same time making such curved line incline to the other surface of the limb, in order to bring the greatest substance of the iron to and near the bend, as heretofore, when making each limb of a ships' knee wedge form or tapering, and also for forming the groove or surface of the rolls of such a shape as will enable the operator to roll iron tapered on the side, instead of top and bottom, as heretofore.

GERISH, F. W. *An improvement in the manufacture of cast hinges.* Dated Jan. 4, 1856. (No. 40.)

One flap of a hinge is first cast with two projections, in each of which is a conical hollow. This flap is then placed in a mould suitable for forming the other flap, and metal is then run into the mould, by which the one flap will be produced with conical projections and fitting the conical hollows in the other flap, and by the shrinking of metal of the second flap the two cones which form the axes by which the two flaps are combined will become free in the conical hollows and work freely therein.

NORTH, R. S., and R. PEACOCK. *Improvements in metallic packings for pistons.* Dated Jan. 4, 1856. (No. 41.)

In the groove or space around the body of the piston, and between its upper and lower plates, a flat spiral spring, the width of the packing space, is fixed, clipping the body of the piston, and on this flat spiral spring are placed three metallic rings, to form the packing, such rings having a tendency to expand. The first or chief ring is flat on its inner surface, with a rib or projection on its outer surface. This ring fits into the groove or packing space of the piston round the flat spiral spring, and the rib or projection comes against the cylinder. The two other rings are flat on both the inner and outer surfaces, and are placed on the two sides of the rib or projection on the first or chief ring, and they come flush with the outer surface of the rib or projection, and thus their outer surfaces and the outer surface of the rib or projection constitute the wearing surfaces of the packing.

JOHNSON, W. O. *An improvement in apparatus used for giving notice when the water in a steam boiler is too low.* Dated Jan. 4, 1856. (No. 42.)

A hollow float is attached to a rod which passes through a guide, and has a stop to prevent the float falling too far; the upper

end of the rod is attached by a pin joint to a plug, with a stem which enters the tube of a steam whistle, and is guided thereby. When the water in the boiler is at a proper height, the float presses the plug into its seat, and no steam escapes; but when the water falls too low, the plug descends with the float, and the passage to the whistle is opened.

BESSEMER, H. *Improvements in the manufacture of iron and steel.* Dated Jan. 4, 1856. (No. 44)

Claims.—1. The conversion of fluid crude iron into steel, or into malleable iron, by exposing the metal to the decarbonising action of currents of air in furnaces through which the metal is allowed to fall for that purpose. And also, in the manufacture of iron and steel, the alternate rising and lowering of two furnaces, so as to allow the fluid metal to flow from one to the other. 2. In manufacturing malleable iron and steel from crude iron while still in a fluid state, the use of revolving furnaces, having apparatus in the interior for the purpose of elevating portions of the metal, and allowing it again to fall in streams or showers when exposed to the action of currents of air passing through the furnace. 3. In the manufacture of iron and steel, the suspension of the fluid metal in a furnace by means of centrifugal force, generated by the rotation of such furnace, and the forcing into, through, or upon the fluid metal suspended, currents of air or steam. 4. The manufacture of bars, rods, or plates of steel, by the cementation of bars or rods of malleable iron, that have been obtained by the direct conversion of crude iron into malleable iron, and while still in a fluid state cast in suitable moulds.

CORBETT, J. *A new or improved method of preserving the tuyeres of blast furnaces.* Dated Jan. 5, 1856. (No. 48.)

Claim.—Causing a deficiency of water to the tuyeres to occasion the sinking of a float, and thereby open a communication between the blast-pipe and a whistle, or other signal capable of being worked by condensed air.

HANSON, C. A., and J. WORMALD. *Improvements in signal and other lamps.* Dated Jan. 5, 1856. (No. 50.)

This invention is applicable to lamps exposed to strong currents of air, such as railway signal lamps, and consists in adapting flap valves to the air passages into and out of such lamps.

JARVIS, C., and T. D. CLARE. *A new or improved oven or kiln to be used in the manufacture of coke and pottery, and for heating and drying generally.* Dated Jan. 7, 1856. (No. 52.)

The patentees construct ovens or kilns in which the heated air and flame from a furnace are made to circulate around a lining or cistern in which the coal to be coked, or matters to be heated or dried, are contained. They also connect a number of these ovens or kilns together, so that the heated air and flame from the first shall pass through the whole.

LISTER, S. C., and W. TONGUE. *Improvements in machinery for combing wool, cotton, and other fibrous materials.* Dated Jan. 7, 1856. (No. 53.)

This is a very comprehensive specification, containing twelve different heads, and is too long to be given here.

BROOMAN, R. A. *Improvements in machinery for boring and excavating.* (A communication.) Dated Jan. 7, 1856. (No. 55.)

This invention consists of certain machinery whereby earth, stone, and rock are bored and excavated; the *débris*, or parts dug out, are deposited out of the track of the machine; and the machine is made to propel itself forward, all these actions being simultaneous, and communicated from the same prime mover.

NEWTON, A. V. *An improved mode of manufacturing rods, shafts, and tubes of iron and steel.* (A communication.) Dated Jan. 7, 1856. (No. 56.)

This invention is applicable chiefly to gun barrels. The operator takes a round bar of iron or steel, and heats one end red hot; he then fixes one end of the bar, say the heated end, in a vice, and turns the cool part round on its axis. The heated part yields and takes a twisted form, the fibres of the metal being laid in a helical direction. The metal while red hot is subjected to hammering on the end, by which means the proximate edges of the helical twist will be welded together. The next thing is to reheat the bar a little below the part just operated upon, and the like operation of twisting and hammering is repeated. When one-half of the bar has been thus twisted and knocked up, the workman turns ends, and proceeds with the other.

TRUMAN, E. T. *Improvements in artificial palates and teeth.* Dated Jan. 8, 1856. (No. 61.)

This invention consists in embedding or combining metal wire gauze in or with any mineral substance employed in the manufacture of artificial palates and teeth. Or instead of using wire gauze, metal plate perforated so as to form network may be employed. The object of the invention is to afford as extended a medium of attachment as may be to resinous substances, such as gutta percha, or to metals.

STUART, H., and J. PRITCHARD. *Improvements in watches and chronometers, which improvements are also applicable to clocks and other time-pieces.* Dated Jan. 8, 1856. (No. 62.)

This invention consists of improvements in the escapement. The patentees use an extra pinion to give the full seconds beat, and a minute wheel attached to the centre pinion tooth, with twice the number of teeth as each of the two ordinary ones. They make the frame of the pallet of an oblong piece of metal, and the pallet in the form of a triangle, jewelled in the ordinary way. For the remaining details, the drawings must be consulted.

FONTAINEMOREAU, P. A. L. DE. *Certain improvements in jacquard machines.* (A communication.) Dated Jan. 8, 1856. (No. 63.)

This invention consists in an improved hook or lifting wire for jacquard machines, which hook allows the substitution of paper cards for pasteboard cards employed in weaving. The improved hook is formed of two branches. One branch is exactly similar to that of the common hook; the other, parallel to it, is nearly of the same length, and is so constructed as to form a spring which brings it always to its parallel position. These two branches are passed through a longitudinal eye in the needle, through which they play up and down when the griffe takes up the hook in the usual way. Another eye rests upon the bottom board of the machine.

MIDDLETON, S. *An improvement in the leather covered rollers used in spinning machinery.* Dated Jan. 8, 1856. (No. 64.)

This improvement consists in covering such rollers with leather made without a seam. The covering is made from a tubular piece of leather, produced by tanning, or rendering into leather the skin of the tails, legs, or parts of the animal of small diameter.

HALD, G. J. C. E. *Improvements in the construction of stoves.* (A communication.) Dated Jan. 9, 1856. (No. 66.)

This invention consists in forming the interior of the stove of bricks or other suitable material, within which a circular spiral flue is formed, also in the employment of a ball of iron or other material for cleansing such flues.

GATTY, F. A. *Improvements in the manufacture of lake colours.* Dated Jan. 9, 1856. (No. 67.)

This invention consists in the application of salt of antimony (by preference the chloride), for precipitating the colouring matters of dye materials, such as japan wood, logwood, cochineal, &c., thereby producing colours commonly called lakes.

BARRIE, W. *An improved reflective leveller.* (A communication.) Dated Jan. 9, 1856. (No. 69.)

This invention relates to improvements in Romershausen's hand-leveller, and consists in the application of that reflecting instrument to telescopes where lenses are employed, in order that the reticule may be placed in the focus of an ocular lens.

HALLEN, E., and W. H. KINGSTON. *Improvements in communicating between the guards and engine-drivers, and between the passengers, guards, and engine-drivers of railway trains.* Dated Jan. 9, 1856. (No. 70.)

This invention consists of a reservoir in the guard's van or carriage, to which one or more whistles or pipes, which can be sounded when required, are connected. This reservoir is supplied with air, forced into it at a high pressure, by means of bellows with single or double feeders, worked by levers or windlasses, moved by contrivances connected with the axletree, the wheel, or the break of the van or carriage, or by the hands or feet of the guard.

ASHWORTH, J., jun. *Certain improvements in lap machines or apparatus used in the preparation of cotton and other fibrous substances for spinning.* Dated Jan. 9, 1856. (No. 71.)

These improvements apply to "lap machines," and consist in furnishing the rod or axis of the lap roller, upon which the lap is formed, with two flanges or plates, one at each end, the object of which is to prevent the friction and drag upon the ends or selvedges of the lap against the framing of the machine. These flanges or plates revolve along with the "lap-roller," one of them being so attached to the rod or axis as to be removeable for the purpose of taking off the lap.

BILLING, M., and F. A. HARWOOD. *New or improved machinery for the manufacture of paper bags.* Dated Jan. 10, 1856. (No. 77.)

Claim.—Manufacturing paper bags by machinery, in which the pasting of the paper and the folding of the said paper upon a contracting block or mould are effected by a certain mechanical combination.

ERSKINE, J. *The application of a new material or mixture for dressing or sizing textile fabrics or materials.* Dated Jan. 10, 1856. (No. 79.)

This material is composed by mixing together potato flour and wheaten flour, or potato flour and rice flour. The proportions used or recommended are half potato flour and half wheaten flour or rice flour.

HERBERT, J. A. *An improved method for extracting the dirt or the gum, or the colouring matter, or the principle from various vegetable or animal substances or materials.* (A communication.) Dated Jan. 10, 1856. (No. 80.)

This invention consists in performing the manipulation in a permanent vacuum, either with heat or otherwise, as may be

required from the nature of the substances operated upon.

CLARKSON, T. C. *A combination of certain materials for forming and making improvements in ship and other pumps, tubes, and which is also applicable for ship, carriage, and other building purposes and parts thereof.* Dated Jan. 11, 1856. (No. 84.)

The materials for forming the improved pumps are alternate layers of thin wood, canvas, prepared leather, and sheet cork, adhered by adhesive substances, such as India-rubber, marine glue, dissolved shellac, gutta percha, or other adhesive substances, &c. In the formation of compass timbers and other spars, tubes, &c., for ship, carriage, or other building purposes; the alternate layers before-named are used according to the objects to be made. In the formation of tubes and shoots for attaching to the pumps for conveying water or other liquids, under or above ground, thin wood, or sheet cork, from an eighth to one-fourth of an inch in thickness, is used with canvas or prepared leather adhered between the two surfaces of wood, and in some cases adhered internally and externally, and coated inside and out with the substances above named.

NEWTON, A. V. *A new or improved method of curing meats, preserving provisions, and ventilating and cooling buildings, cars, and vessels.* (A communication.) Dated Jan. 11, 1856. (No. 85.)

The inventor proposes to employ currents of air (artificially dried by ice or its equivalent), and circulating through the room, apartments, or building wherein the curing, preservation, ventilation, or cooling takes place.

POLE, W., and F. W. KITSON. *Improvements in railway wheels.* Dated Jan. 11, 1856. (No. 86.)

Instead of fastening the tyre to the rim by screw bolts placed in the middle or tread (which is the ordinary plan) the patentees secure it, at or near its two edges, by means of a dovetail or under cut lap joint at one edge, and by screws at the other edge, or by screws at the two opposite edges.

SMITH, W. *Improvements in ploughs and other cultivating implements.* Dated Jan. 11, 1856. (No. 87.)

This invention will be described in an early Number.

BAIN, A. *Improvements in the construction of inkstands.* Dated Jan. 12, 1856. (No. 89.)

Claim.—The invention of inkstands constructed so as to turn on fulcrums or axes placed below the longitudinal centre of such inkstands, so that they will steadily retain their position whichever end is uppermost. Also actuating the lids by means of the movements of the ink-holders.

SAUTELET, E. C. F. *An improved process of tanning.* Dated Jan. 12, 1856. (No. 90.)

Claims. — 1. The tanning of hides or skins, by exposing them to the percolation of soap and water or other cleansing liquid, capable of removing the grease without injuring the fibre, and then exposing them to the percolation of the tanning liquid. 2. The tanning of hides or skins by the successive or alternate application of the tanning liquid and a solution of gelatine. 3. The improved process of tanning, by the successive operations of cleansing and tanning by percolation under pressure, and finishing with a solution of gelatine.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

CLARKE, W. S. T. *Improvements in ventilation.* Dated Jan 4, 1856. (No. 43.)

This invention consists in effecting ventilation by the adaptation of apparatus consisting of pipes, tubes, viaducts, and reservoirs (one or more or all of them), communicating with the external atmosphere, such apparatus having sheets or plates of vulcanised, alumised, or coated wire netting, or thin perforated metal, arranged so that the air, vapour, &c., passing through the apparatus "must pass through the plates and be infinitely commuted or divided."

KAMMERER, R., and C. BREWER. *Improvements in electric clocks or timekeepers.* Dated Jan. 5, 1856. (No. 45.)

At the back of the dial plate are secured two pieces of glass, to which are fixed two ordinary electric magnets, placed opposite each other, the free ends of the iron cores being placed apart to allow the pendulum to oscillate between them. To the pendulum is attached a piece of magnetised metal, which is alternately attracted and repulsed by the electro-magnets when the wires are connected with a battery.

COXETER, J. *An improvement in an apparatus for generating steam for medical and other purposes.* Dated Jan. 5, 1856. (No. 46.)

This apparatus is placed in front of any common fire, and held there by two small hooks, an iron tube which forms part of it being pushed into the fire, so as to become heated.

HINDLE, H. *Improvements in valves or apparatus for regulating the flow of steam and gas.* Dated Jan. 5, 1856. (No. 47.)

These improvements consist in certain modifications of a cylinder, having fitted within it a cylinder or drum, one cylinder forming a part of the passage through which the steam or gas is to be conveyed, and having formed in its sides, openings, or

orifices, for the passage of steam or gas, the other cylinder being fitted so as to cover or uncover these openings or orifices by a revolving or reciprocating movement.

THERESE, L. A. *Certain improvements in harness.* Dated Jan. 5, 1856. (No. 49.)

This invention consists in a new buckle, saddle-box, and harness pad. The buckle is formed with a frame, and for the ordinary moveable tongue or tongues fixed studs are substituted. Holes in the traces, or other parts of harness, are made at required distances in the usual manner, and these are held by the studs. Saddle-bows and pads are formed of stout leather previously bent to the required form.

DELPERDANGE, V. *Improvements in metallic and elastic packing.* Dated Jan. 7, 1856. (No. 51.)

These improvements relate to means of combining a series of elastic metallic rings within a suitable box, with means of keeping them pressed to the rod or other axis to be packed.

BARTER, T. *An improved apparatus for administering vapour and douche baths.* Dated Jan. 7, 1856. (No. 54.)

This apparatus consists of a dome-shaped vessel for containing water, into the upper part of which is fitted a collar, into which is dropped a stop-cock. The upper end of the stop-cock is furnished with a pin, while a rose is cut with a vertical and horizontal slot, which, on being placed on the stop-cock, forms with the pin a bayonet joint. When for administering a douche bath, instead of the rose, the inventor fits telescopic tubes, carrying a spreader at their further end, and fitted with joints, whereby the douche may be directed upon any part of the body. The stop-cock, by merely dropping into its seat, is sufficiently tight to bear a moderate pressure of steam; but should the pressure exceed that, the stop-cock acts as a safety valve, and is blown out of its seat. The vessel is dropped into a suitable frame, in which is fitted a spiral lamp.

PARISET, C. L. *An improved paste for manufacturing paper, pasteboard, and other similar products.* Dated Jan. 8, 1856. (No. 57.)

This invention relates to the preparation of a paste or pulp from grass or hay and similar plants used as forage, and also from weeds and other herbs, either in a fresh or dried state.

BOWRA, M. E. *Improvements in the nature and manufacture of waterproof garments and other goods.* Dated Jan. 8, 1856. (No. 58.)

In making and ventilating waterproof goods, the inventor cuts the garments in the usual way, and at the bottom or skirt attaches a piece of waterproof cloth, which when required, can be used as a ground sheet or cover, coat, cloak, &c. This piece will protect the legs from wet. Secondly, he puts a cape on the garments in the usual way, and under such cape he perforates the back, chest, shoulders, and seams.

PIETRONI, C. *Improvements in printing on cloth and other fabrics.* (A communication.) Dated Jan. 8, 1856. (No. 59.)

This invention consists of apparatus so disposed as to print fabrics on the under side by an upward pressure of the printing surface, or by a downward pressure of the fabric upon the printing surface.

LOCKE, G. B. *Improvements in signalling from trains whilst in motion.* Dated Jan. 8, 1856. (No. 60.)

This invention has reference to apparatus to be attached to the rear of a train, whereby detonating or other signals may be placed upon the rail. The inventor uses a guide descending from the carriage to the top of the rail, where it should be steadied by a flanged wheel or other appliance. In the guide he uses a rod to convey the signal down the guide to the rail under a roller which rolls it on to the rails, the same to be provided with prongs which project on each side of the rail, and press down upon the straps of the signal, causing them to clasp the rail. To show when a signal is on the rail, each signal gives light in darkness, and smoke in the light, without signalling.

PITMAN, J. T. *An improved mode of applying diastase and heat to saccharification of starch.* (A communication.) Dated Jan. 9, 1856. (No. 65.)

The diastase contained in ground malt designed for mashing is dissolved in water, which is afterwards drawn off through the false bottom of the mash-tub. A portion of diastase remains in the tub, in order to save which the mass is mashed, and then brought to a high temperature, to break the integuments of the grains or cells of starch. Afterwards the mass cools down to a point at which the diastase exerts its saccharifying power. The dissolved diastase is divided into as many portions as there are wettings to be made, and these portions are successively added to the boiled malt. This produces a fresh cooling, and the malt must again be brought up to the temperature suitable for saccharification.

JEANNE, V., and A. and M. E. MARTIN. *An improved grease-box for axles, journals, and other rotary parts of machinery.* Dated Jan. 9, 1856. (No. 68.)

This invention relates to modifying the construction of grease-boxes, and using water for cooling the parts. The modifications consist of a water tank, and a pipe, one part of which is formed of metal and one

of caoutchouc connecting the reservoir with the lower part of the grease-box.

HEEGAARD, A. *Improvements in making channels or flues.* Dated Jan. 9, 1856. (No. 72.)

This invention consists in applying the principle of the screw as a means of obtaining, within a given space, a long continuous channel or flue for air or smoke in brickwork or other material.

ALEXANDRE, L. *Improvements in propellers for vessels.* Dated Jan. 9, 1856. (No. 73.)

The inventor proposes to employ reciprocating buckets or paddles (which fold on the return stroke) in recesses or channels on either side of the keel.

BARKER, C. M. *An improvement in the pistons of steam engines.* Dated Jan. 9, 1856. (No. 74.)

This invention consists in making each surface of a piston on which the steam presses semi-spherical, convex, or concave, in order to obtain a larger area for the pressure of the steam!

WATSON, W. *Improvements in the arrangement of furnaces.* Dated Jan. 9, 1856. (No. 75.)

These improvements consist in so arranging furnaces that the fuel shall be first placed upon a hearth, and be there partially consumed; and then be readily pushed on to fire-bars for the completion of its combustion, and so that the gases evolved in the first stage of combustion are consumed on passing over the fire-bars.

ADCOCK, H. *An improvement in casting iron and other metals.* Dated Jan. 9, 1856. (No. 76.)

This invention consists in employing highly heated moulds, and in heating them as follows:—Sand moulds are placed in an oven or muffle and dried gradually. The fire is then increased until the moulds are brought to a very high degree of heat; the metal is run into the moulds, and then the oven or muffle, together with the moulds and castings therein, are allowed to cool down.

DARLINGTON, J. *Improvements in the manufacture or production of zinc or spelter.* Dated Jan. 10, 1856. (No. 78.)

This invention consists in taking the oxide of zinc as produced from the ores of zinc, and causing it to pass through a fire, either enclosed in a furnace or in a suitable tube.

FERNIHOUGH, J. *Improvements in steam boilers and apparatus for consuming smoke.* Dated Jan. 11, 1856. (No. 81.)

The inventor fixes boilers in a vertical position, and connects them so that the steam generated will circulate through them. He places a fire-place under each, so that the heat will ascend and surround each boiler, thus making the whole a heating surface. He also proposes to fix or suspend in each boiler a steam cylinder, which will have a water space all round it.

PROVISIONAL PROTECTIONS.

Dated May 3, 1856.

1052. Evan Thomas, of Holywell-street, Millbank, Westminster, clock maker. Improvements in the construction of counting apparatus for ascertaining and indicating the number of rotations made by shafts or spindles in various descriptions of machinery.

Dated June 5, 1856.

1344. Duncan Campbell Dallas, of Islington, Middlesex, gentleman. Improvements in chemical preparations applicable to the photographic and photogalvanographic processes.

Dated July 23, 1856.

1748. Henry Doubleday, of Coggeshall, Essex. An improvement in the manufacture of starch.

Dated July 30, 1856.

1802. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in ladies' skirts or petticoats and dress improvers or bustles. A communication from Madame Vernier.

Dated August 2, 1856.

1828. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in the manufacture of artificial fuel. A communication.

1830. Josiah Rhodes, of the Holborn Brass Foundry, Nottingham. Improvements in machinery or apparatus for reducing turnips and other vegetable substances to a pulpous state.

Dated August 4, 1856.

1832. Josiah Harris, of Dolgelly, Merioneth, North Wales, gentleman. An apparatus for collecting and condensing smoke and gases generated in furnaces.

Dated August 7, 1856.

1861. Alexandre Théodore Nicolas Goll, of Rue de Brétagne, Paris, France. An improved button.

1863. Samuel King, of Brighton, Sussex. Improvements in spirit lamps.

1865. Charles Wright, of Green-street, Southwark. Improvements in the preparation of lubricating materials.

Dated August 8, 1856.

1867. Joseph Leese, junior, of Manchester, Lancaster, calico printer. Certain improvements in machinery used for printing calico and other fabrics.

1869. Thomas Austen, of Waltham Abbey, Waltham Holy Cross, Essex, civil engineer. A machine for ascertaining the propelling force of gunpowder.

1871. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improvements in machinery for composing and distributing types. A communication.

1873. Diederich Fehrman, of Liverpool, Lancaster. Improvements in lamps adapted for burning resin oil. A communication from F. Benkler, of Wiesbaden.

Dated August 9, 1856.

1875. William Webster, of Bunhill-row, Middle-

sex. An improved valve cock. A communication from A. Van Horn, of New York.

1877. Emile Kopp, of Paris, professor of chemistry. Improvements in the manufacture of gas.

1879. Eugene Ernest Amyot, physician, of Paris, French Empire. Improvements in the preparation of pulp for paper, pasteboard, and other uses for which pulp is required.

1881. Archibald Lockhart Reid, of Glasgow, Lanark, N.B., print cutter. Improvements in producing ornamental figures or devices on textile fabrics and other surfaces.

1883. George Anderson, of Queen's-road, Dalston, Middlesex, gas engineer. Improvements in the construction of taps or valves for regulating the passage of gas.

Dated August 11, 1856.

1885. John Cartland, of Birmingham, Warwick, manufacturer. A new or improved door spring.

1887. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. An improved fermenting agent. A communication.

Dated August 12, 1856.

1889. Armand Rieupayroux Janet, of Perigueux, in the Department of Dordogne, France, tailor. A certain apparatus for taking measure of coats.

1891. Joses Weaver Downing, of Birmingham, Warwick, metallic bedstead maker. Improvements in the manufacture of metallic and other wheels and pullies.

1893. John Hardaker, of Leeds, York, commission agent. Improvements in machinery or apparatus for stopping railway trains, which are also applicable for alarm signals generally.

Dated August 13, 1856.

1895. Richard Dugdale Kay, of Accrington, Lancaster, manufacturer. Improvements in machinery or apparatus for washing, scouring, cleaning, preparing, dyeing, or finishing woven fabrics, yarns, or threads. A communication.

1897. Jean Baptiste Clara, of Rue de l'Echiquier, Paris, France, civil engineer. Certain improvements in producing and employing steam and the gaseous products of combustion for obtaining motive power.

Dated August 14, 1856.

1899 Edward Hallen, of Cornwall-road, Lambeth, Surrey, civil engineer, and William Holland Kingston, of Bandon, Cork, Ireland. Improved means for making signals on railways.

1901. John Knowles, of Holcombe Brook, Lancaster, manufacturer, and William Clarke, of Manchester, manufacturer. Certain improvements in looms for weaving.

1903. William Morgan, of Gloucester-terrace, Hyde-park. Improvements in the manufacture of guns and mortars.

1905. Peter Augustin Godefroy, of King's Mead Cottages, New North-road, Islington, Middlesex, operative chemist. An improved treatment of the matrix of rock quartz, and all like substances, for the extraction of auriferous, argentiferous, and other metals contained therein.

Dated August 15, 1856.

1908. Henry Columbus Hurry, civil engineer, of Wolverhampton, Stafford. Improvements in railway crossings.

1910. Col Stephen Szabó de Kis-Geresd, of Widnes, near Warrington, Lancaster. Improvements in obtaining motive power.

1912. Henry Dubs, of the Vulcan Foundry, Warrington, Lancaster, engineer, and Josiah Evans, of Haydock, engineer. Improvements in effecting the consumption of smoke.

Dated August 16, 1856.

1914. William Hargreaves, of Bradford, York, machine wool comber. Improvements in colliers' combing machine, in combing wool, hair, cotton, silk, flax, and other fibrous substances.

1916. David Chalmers, of Manchester, Lancaster, machinist. Improvements in looms for weaving.

1918. Alfred Hodgkinson, of Springfield Bleach Works, Belfast, Antrim, Ireland. Improvements in bleaching, scouring, and cleansing plain and embroidered fabrics.

1920. Philippe Pierre Hoffmann, of Strasbourg, France. An improved compound to be used for waterproofing fabrics, paper, leather, or other materials.

Dated August 18, 1856.

1922. Thomas C. Richardson, of Drury-lane, Middlesex. The process for the procuring and manufacturing the sulphosaccharate of simarubine.

1924. William Tytherleigh, of Birmingham, Warwick, accountant clerk. A new or improved manufacture of rollers or cylinders for printing fabrics.

1926. William Colborne Cambridge, of Bristol, engineer. Improvements in the construction of portable railways.

1928. John Stopperton, of the Isle of Man. Improvements in propelling vessels.

1930. Andrew Peddie How, of Mark-lane, London, engineer. Improvements in pumps.

Dated August 19, 1856.

1932. James Leach, William Turner, and John Tempest, of Rochdale, Lancaster. Improvements in rollers, applicable to condensing and all other kinds of engines, for carding wool, cotton, and other fibrous materials.

1934. Pierre Noyer, of Gerrard-street, Soho. Winding up fusee watches and pocket chronometers, and setting the hands without key.

1936. Henry Burden, of Troy, Rensselair, New York, U.S. Improvements in machinery or apparatus for manufacturing shoes for horses, mules, and other animals.

1938. Henry Bessemer, of Queen-street-place, New Cannon-street, London. Improvements in the manufacture of iron and steel.

1940. James Apperly, of Dudbridge, near Stroud, Gloucester, cloth manufacturer. Improved machinery for carding wool or other similar fibrous substances.

1942. Anthony Charles Vetter de Doggenfeld, of Trinity-square, Brixton, Surrey. Improved glass ornaments for ornamenting gardens, summer houses, dinner and other tables, and for other ornamental or decorative purposes.

Dated August 20, 1856.

1944. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in roller fulling mills. A communication from T. Wiede, of Chemnitz, and E. Pressprich, of Grosseuhain, Saxony.

1946. Charles Clark, of Somerset terrace, Albion-road, Stoke Newington, Middlesex. Improvements in combining and arranging looking glasses for toilet purposes.

1948. Jules Laleman, of Lille, France. Improved machinery for combing flax and other similar fibrous materials. A communication.

1950. Joseph Maudslay, of Lambeth, Surrey, engineer. Improvements in steam engines, especially applicable to screw propulsion.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," September 2nd, 1856.)

964. D. Lloyd. Improvements in washing minerals, coal, and ores.

967. W. G. Armstrong. Improvements in apparatus for lifting, lowering and hauling.

972. J. Garnett. Improvements in twisting, winding, and reeling yarn, and in machinery or apparatus employed therein.

980. A. S. Stocker. Improvements in the application of certain materials to the manufacture of ink and other stands and other articles, and in the manufacture and finishing of articles produced out of such or other material or materials.

1000. E. Topham. Apparatus for cleansing out the sediment from the water in steam boilers, and preventing incrustation in the same.

1011. W. D. Ruck. An improvement in tanning hides and skins.

1014. J. S. Crosland. Certain improvements in furnaces and steam generators for locomotive steam engines and other purposes.

1015. T. Greenshields. Improvements in sleepers for railways.

1021. J. Smith and W. Craven. Certain improvements in machinery or apparatus for dressing, machining, and finishing velvets, velveteens, and other fabrics.

1028. N. Defries and G. H. Bachhoffner. Improvements in gas fires.

1031. C. Perron and V. Boulland. An improved knitting machine.

1038. S. Hunter. An improvement in anchors.

1059. A. Chadburn. An improved construction of pressure gauge.

1063. J. Wright. Improvements in apparatus for lowering ships' boats.

1081. J. G. Lawrie. Improvements in steam engines.

1091. L. L. Jardin and J. Blamond. Certain improvements in engraving on stone, earthenware, china, and glass, and also in ornamenting the same.

1107. J. H. Johnson. Improvements in machinery or apparatus for cutting irregular forms. A communication.

1119. W. E Newton. Certain improvements in machinery for pumping and forcing water and other fluids. A communication.

1120. W. E. Newton. Improved machinery for splitting or cutting blocks of wood for match splints kindling wood. treenails, and other purposes. A communication.

1140. A. Meillet. An improved artificial stone for grinding, sharpening, and polishing.

1172. J. J. Meyer Improvements in machinery for mortising, tenoning, rounding sweep and straight moulding, boring, grooving, and mitreing.

1175. R. Knight. Improvements in apparatus for aërating liquids.

1182. G. Clark. Improvements in the manufacture of illuminating gas.

1196. A. V. Newton. An improved rotary pump. A communication.

1197. J. H. R. de Castro. An improved method of propelling railway or other carriages up inclines. A communication.

1212. T. Lawrence. Improvements in machinery to be used for grinding and polishing gun-barrels, swords, matchets, bayonets, scythes, firearms, and other articles similar in transverse section to any of those above named.

1404. S. de Jong. Improvements in warming and ventilating apartments and buildings.

1579. J. A. Manning. Improvements in the manufacture or production of manure.

1592. W. C. Cambridge. An improvement in the construction of press-wheel rollers and clod-crushers.

1711. W. Papineau. An improvement in the production of spirits of wine.

1730. S. Colman. Improvements in steam boilers.

1739. G. North. An improved spring catch for the security of jewellery and articles of personal ornament and general utility.

1750. J. Webster. Improvements in distilling and treating rough turpentine and resinous matters.

1818. A. Tolhausen. A new and improved flexible pocket umbrella, being likewise applicable to common and other sticks, canes, &c. A communication.

1871. W. E. Newton. Improvements in machinery for composing and distributing types. A communication.

1887. R. A. Brooman. An improved fermenting agent. A communication.

1899. E. Hallen and W. H. Kingston. Improved means for making signals on railways.

1906. J. Goddard and G. Hulme. Improvements in carding-engines for the more speedy and effectual doffing or stripping of the cotton, woollen, silk, or other fibrous substances therefrom.

1936. H. Burden. Improvements in machinery or apparatus for manufacturing shoes for horses, mules, and other animals.

1950. J. Maudslay. Improvements in steam engines, especially applicable to screw propulsion.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1853.

2000. Joseph Cundy.
2001. Edward Patrick Gribbon.
2002. Peter Armand Lecomte de Fontainemoreau.
2004. John Henry Johnson.
2008. Charles Goodyear.
2009. Charles Goodyear.
2010. Joseph Cundy.
2013. William Edward Newton.
2021. William Edward Newton.
2029. John Tayler, James Griffiths, and Thomas Lees.
2060. Weston Grimshaw and Ellis Rowland.
2100. John Ward and Edward Cawley.

LIST OF SEALED PATENTS.

Sealed August 26, 1856.

1856.

545. John Edward Hodges.
568. John William Scott.
593. Henry Horner and Richard Bagley.
615. Prosper Pimont.
618. Phillip Marcus.
619. William Yates.
622. Charles Coates.
625. Edwin Thomas Wright.
659. Alfred Vincent Newton.
1023. Samuel Dyer.
1227. Charles Dewick.
1241. Frederick Peter Dimpfel.
1273. Thomas Skaife.

1543. George Harvey and Alexander Harvey, jun.
1561. Alfred Vincent Newton.

Sealed August 29, 1856.

528. John Reading.
531. Paul Rapsey Hodge.
534. Ferdinand Kaselowsky.
550. Charles Thomas Rosenberg.
551. Martin Samuelson.
555. Richard Dugdale Kay.
591. Henri Petitpierre.
594. George Spencer.
612. Thomas Porter.
661. Charles Frederick Parsons.
662. Richard Archibald Brooman. [reau.
664. Peter Armand Lecomte de Fontainemo-
669. John Trueman.
728. William Edward Newton.
1201. Alexandre Henri Dufresne.
1337. Alexandre Louis Gibon and André Fröhlich.
1492. Alexander Kelller.

Sealed September 2, 1856.

539. Adolphus Oppenheimer.
554. Samuel Clegg and John Kay.
556. William Billinton.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICE TO CORRESPONDENTS.

*** Articles and Correspondence intended for insertion in the next number of this Magazine, should reach the Office, 166, Fleet-street, London, by Tuesday next.

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Lister & Tongue ... Combing Fibres 233
Brooman ..... Boring and Excavating 233
Newton ..... Bars, Tubes, &c. 233
Truman ..... Artificial Teeth 233
Stuart & Pritchard Watches, &c. 233
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Middleton ..... Covering Rollers 234
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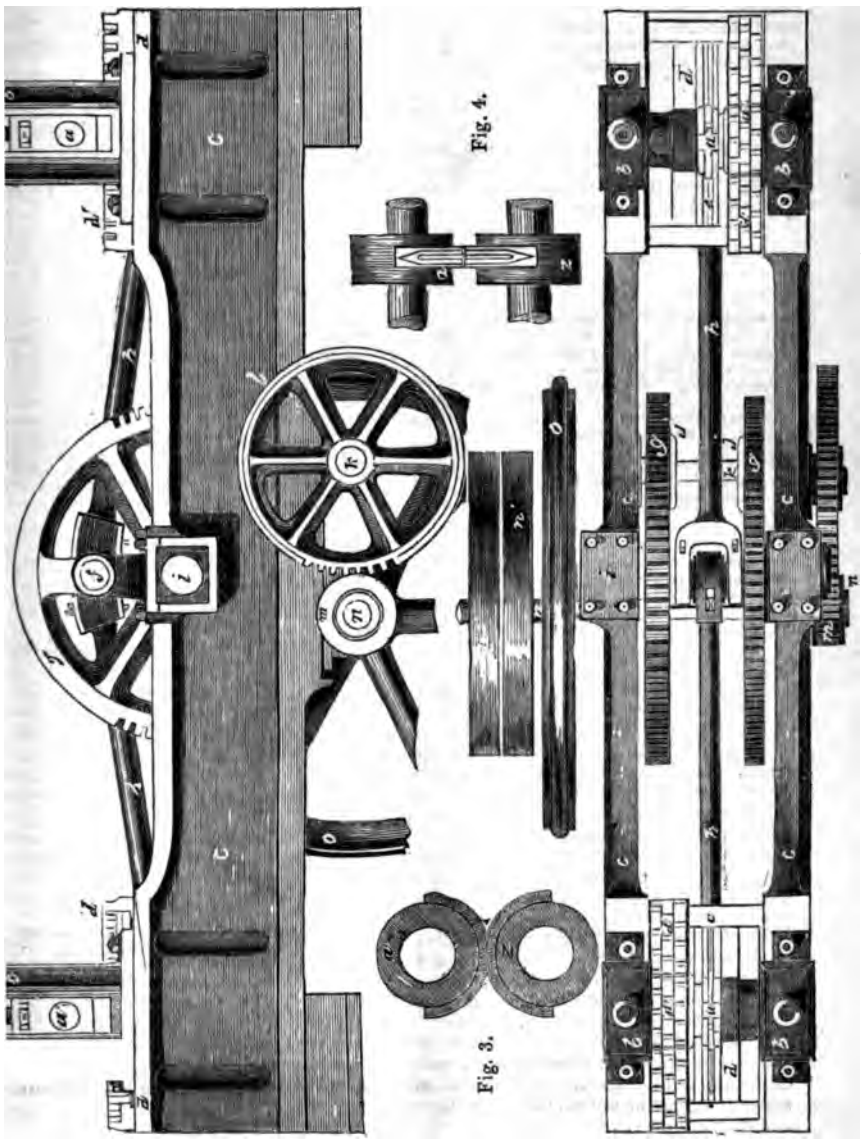
LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1727.] SATURDAY SEPTEMBER 13, 1856. [PRICE 3D.

Edited by R. A Brooman 166, Fleet-street.

PRESTON'S IMPROVED MACHINERY FOR SHAPING AND ROLLING METALS.



PRESTON'S IMPROVED MACHINERY FOR SHAPING AND ROLLING METALS.

Mr. Francis Preston, of Manchester, has recently patented various improvements in machinery for shaping and rolling metals, which consist—First, in certain improvements applicable to the machines for forming or finishing the flutes in bayonets, described in the specification of the patent granted to him 30th December, 1854, and described and illustrated at page 217 of our sixty-third volume, No. 1674, for September 8th, 1855. Secondly, in the application of such machines to shaping swords, lance-heads, flyers, and other articles in which uniformity of shape is required. Thirdly, in the direct application of a steam engine for working shaping and rolling machines. Fourthly, in forming the requisite grooves for shaping or rolling bayonets, swords, lance-heads, and flyers, in suitable dies, placed upon two rollers or cut on the circumference of two rollers, which are made to revolve first in one direction and then in the other.

Fig. 1 is a side elevation of a compound shaping and rolling-machine suitable for forming or finishing the flutes in bayonets, but which, by altering the dies, may be made to shape or roll swords, lance-heads, flyers, and other articles; and fig. 2 is a plan of the same. The former machine was single-acting, that is to say, it was only provided with one roller and one sliding table; in the present instance the machine is composed of two rollers, *a a*, on each of which an eccentric and tapered projection is formed corresponding to the larger flute of a bayonet. The axes of the rollers, *a*, revolve in standards, *b*, fixed to or cast with the bed plate, *c*. Below the rollers, *a*, are the tables, *d*, which slide to and fro in grooves made in the bed plate, *c*; each of these tables support a die, *e*, which is made with a taper groove and a double convex projection of the shape required to form the flutes on the outside of the bayonet. When swords or other articles are to be shaped and rolled, it is evident that the roller, *a*, and die, *e*, must be made with recesses or sunk parts, corresponding to the shape of the sword or other article to be produced. The to-and-fro motion is given to the tables, *d*, by the crank pin, *f*, projecting from the cog wheels, *g*, and by the connecting rods, *h h*. The wheels, *g*, are each fixed on a short shaft, *i*, revolving in bearings placed in the centre of the bed plate, *c*; these wheels are united by the crank pin, *f*, and they are driven by the pinions, *j*, fixed on the shaft, *k*; the object of applying two wheels, *g*, and two pinions, *j*, is to avoid the torsion in the shaft, *i*, and thereby to increase the effective force of the machine. To the shaft, *k*, is fixed the wheel, *l*, to which motion is communicated by the pinion, *m*, keyed or connected to the shaft, *n*, by a groove and key. When the pinion, *m*, is connected to the shaft, *n*, by a groove and key, the wheel, *l*, and pinion, *m*, should be on the same side of the machine as the fly-wheel, *o*. To the pinion, *m*, is fixed a conical friction box, fitting within a conical recess in the fly-wheel, *o*, to which is fixed the driving pulley, *n'*; the fly-wheel and driving pulley are loose on the shaft, *n*. The friction box is thrown out of gear when required by the attendant depressing one of the treadles situate at each end of the machine; these treadles are jointed to levers on a cross shaft, to which is fixed a forked lever, fitting on the sliding friction box.

The mode of operation is as follows:—Motion having been communicated to the machine by a strap passing around the driving pulley, *n'*, the tables, *d*, begin to move slowly to and fro, and this motion is transmitted to the rollers, *a*, by the racks, *d'*, on the tables gearing into the pinions, *a'*, on the axes of the rollers, *a*, in the manner described in the specification and article before referred to. The attendants then place the partly-formed bayonets or other articles in the dies, *e*, and the operations of shaping and rolling continue to be performed at both ends of the machine simultaneously. If it should be required to stop the machine suddenly, the attendant depresses one of the treadles, to draw the friction box out of gear, thereby allowing the driving pulley and fly-wheel to revolve without giving motion to the other parts of the machine. When the direct application of a steam engine is adopted for working shaping and rolling-machines, the inventor prefers to connect the connecting rod of the steam engine to a crank on the shaft, *n*, and when the requisite motion is given by a mangle wheel and pinion, he fixes the mangle wheel to one end of the shaft of the roller, *a*.

The fourth part of the invention relating to shaping and rolling bayonets, swords, lance-heads, and flyers, by two rollers working alternately in opposite directions, will be readily understood by reference to figs. 3 and 4. *a* is the upper roller, similar to the one above described, on which a die is placed of the shape required, and *z* is a second roller, on which another die is placed, or the requisite recesses may be cut on the circumferences of the rollers, which are connected together by gearing, and made to revolve first in one direction and then in the other, by a mangle wheel and pinion or other suitable machinery. It is evident that on putting a piece of heated iron or steel in the rough state between the rollers, *a* and *z*, and giving motion to them in the manner described, the iron or steel will be shaped and rolled to the required form.

ON HEAT AND LIGHT GENERALLY;

AND ON DAGUERRE'S, MOSER'S, DRAPER'S, BECQUÉREL'S, AND PROFESSOR STOKES'S DISCOVERIES ON THESE SUBJECTS.

BY HORATIO PRATER, ESQ.

(*Concluded from page* 224.)

It must never be forgotten, that all *coloured* light, is no longer light *in the proper acceptation of that term. Visible* no doubt such coloured rays are; but, then, they have certainly been *much* ALTERED, by the prism, or the "absorbent media" solutions, and thus it is no longer WHITE light that we see. This reflection will induce me to answer the query lately proposed, whether this so-called decomposition of light is analogous to that of potass into potassium and oxygen, by a negative. You cannot form an appearance like *white* light (as is sometimes stated) by a rapid movement of the coloured rays painted on a board.* The so-called "decomposition" then seems rather a case of *conversion*, proving again the *Protean* character of light. Delaroche proved that *radiating heat becomes more and more capable of penetrating glass as the temperature increases*, till soon after the rays become luminous; in fact, "CONVERTED," at least in part, into light. Light (as it comes from the sun, *combined with heat, &c.*, for the light of the *moon* seems not "convertible") in its turn, seems convertible into *other modes of radiation*, partly visible, partly invisible, by the prism. It seems, then, more correct language to say, that by the prism, light is *converted* into the prismatic *visible* spectrum, and perhaps into the *invisible* chemical rays beyond, than to say it is "decomposed" into the same. *Mere* alteration in colour is not sufficient by good chemical logic to give us any right to call a substance *decomposed;* for this depends on a certain *arrangement of the molecules* on which the light falls, since biniodide of mercury when precipitated is scarlet, but if heated between panes of glass, becomes yellow, and remains so unless it be touched by any pointed instrument,† *when it speedily becomes scarlet again*, as Messrs. Talbot and Warrington first observed. When light, then, by absorption or dispersion, becomes coloured, it seems right only to call it converted, or, somewhat changed; but *certainly not* "decomposed."

This theory of "convertibility" will enable us to see how the interposition of red or yellow glasses (as already stated) tends to alter the chemical action of light on the plate, without being obliged to consider the rays of light *perfectly distinct* from those producing chemical action. Such (especially *yellow*) glasses let *almost* all the light pass no doubt. I say *almost*, for Sir J. Herschel states that some *little* is intercepted. Now, who can prove that this *little*, thus absorbed, is not so "converted" as to destroy the usual chemical action of the light itself which passes? I cannot allow that this experiment is more *simply* explained, by admitting that the most refrangible rays are a distinct class, or *modified rays*, whether they be so, or not. For, on further reflecting on this point, a more decided and obvious case of transference of power, or of "conversion," will appear to be given by these yellow or red glasses, which, be it remembered, *cut off the violet rays*, and let, for the most part, only the red and yellow rays pass. Now the action of these rays, as I before stated, is like that of mercurial vapour on the plate (Gaudin); that is, to make the image on the silver appear more distinct. Hence, probably mercury does this by forming an amalgam with the silver, and thus tending to SEPARATE IT more distinctly from the iodine and bromine.* *But yellow and red glasses must also have this latter effect* (see above); and what in fact is this but *a transference of the chemical power of the violet and invisible rays* to the spectrum generally—to the red and yellow rays, which now compose most of it, since the violet have been "cut off"? If so, they have *left their chemical powers behind in the red and yellow* rays; and as these rays had not such chemical powers before (the prism only being used), the violet rays seem, by the use of red or yellow glasses, *to be converted into red or yellow light.* This fact, then, may be said in reality to have been discovered by Becquérel and Gaudin; I have merely ventured to give what appears a new explanation of it.

I must not, however, by the above be

* And when in Sir I. Newton's experiment *two* prisms are put together so as to form a *square* of glass, although the coloured spectrum *is* then transferred in the shape of a white spot of light to the floor, yet even this is not like chemical synthesis, for in such case the light may be said *never to have been decomposed.* Newton could not, by changing the place of the spectrum, by *one* prism only, make it look other than an indistinct mass of colour.

† This is probably a still more startling fact as to the difficulty of deciding between mere *physical* influences and sensation, at least, *sui generis.* (See former note on Sol. Sulph. Soda, &c.)

* As, however, vapours of iodine or bromine will attack polished metal plates, and as it has been found that when iodide of ethyl is exposed on mercury to light, that even a biniodide of mercury may be formed; the very strong affinity of mercury (and silver), for iodine and bromine should not be forgotten. It seems probable, therefore, as the Rev. W. Kingsley supposes, that "The vapour of mercury deprives the iodide of silver of its iodine, and deposits silver when the daguerreotype plate is exposed to it." Perhaps part of the mercurial vapour may then unite with the silver, and thus the action be complex.

understood as supposing that "*all* the chemical power, or the chemical power *unmodified* of the violet end is by red or yellow glasses converted into red or yellow light. This is proved by the fact of the daguerreotype picture being blackened and obliterated if kept in the solar rays beyond *that very short period*, which constitutes the great discovery of Daguerre on this subject. It is said such "blackening" depends on the liberation of iodine and bromine from the plate. As this explanation is probably correct, the effect probably of yellow and red glasses is to "continue," as Becquérel said, the *same* chemical action as the violet (now "cut off"), but in a *far less intense*, and perhaps even modified state. Sir J. Herschel says, "Some 'yellow media' will diminish photographic effect at least four-fifths." Yellow and red glasses, then, would appear to diminish the *violent intensity* of action that destroys the image and blackens the plate.

Now this different intensity of action is often quite as remarkable as if the action was produced by a *totally different agent*. Dr. Draper (for instance) says that "the red and orange rays, when of a certain intensity, increase the action of daylight on the plate, but if of a less intensity they restrain it."* "In the early part of the year a protective action appears (in Virginia) on the red ray, and about July extends over all the less refrangible rays, and as the year goes out retreats upwards." M. Claudet confirmed these observations, but adds, Draper's experiments were made on an iodized plate only; but when this plate has been subjected subsequently to the action of bromine, or chlorine and bromine, the observations do not apply. He has found that after such treatment "red, orange, or yellow glasses invariably destroy the action of daylight *at any period* of the year."

Again, it is curious that though you cannot *begin* to take Daguerreotypes through yellow media or glasses, yet at the same time in the brilliant light of Mexico nearly half an hour is required to produce the same effect as in England in a minute; and M. Lerebours found that in the bright light of the high Alps it takes six times longer to get an image than even in the *smoky* London atmosphere. All these results (which still want extension by further experiments) tend to show that different *intensity* in the light acts as if an actually different *quality* were added to it. I shall then here ask whether where the light is very strong (as in the tropics) the chemical force is not much diminished, because the chemical rays are "converted" into light? We must remember that these rays always exist at the violet and *dark* end of the spectrum; when, then, increased intensity of the luminous rays takes place, would it not seem that these dark chemical rays are *absorbed* by the increased light and "converted" into light rays only?

I have already alluded to Melloni's accurate experiments, showing that deep violet glasses permit more heat to pass than deep red glasses. He also found (I believe subsequently) that *green* glass should be used, if you wish to prevent the permeation of radiant heat.

I shall now proceed to make some remarks which will tend to show how these experiments have been neglected by some persons who have written on Möser's discovery of invisible radiations producing images in the dark, and how by such neglect their own supposed discoveries have in reality added nothing but *new words* to his stern facts. It is indeed "*vox et prætera nihil.*"

An experimentalist who has so strongly, and, generally speaking, unreasonably opposed Möser, as to provoke a sharp reply from this writer, proceeded, in 1843, on the supposition that blue glass obstructs heat, and that red glass lets it pass. When, then, he finds Möser's images developed more clearly under the latter colour than under the first, he invariably attributes the effect to the heat rays of the spectrum. Now in this he had entirely overlooked Melloni's experiments on different coloured glasses lately alluded to; and even his experimental results on this subject are directly opposite to those of Möser, who relates an experiment in which, when only a trace of the image was evident under red and yellow glass, it (in his own words translated) "was clearly defined under the violet glass."* Now not only do Möser and Melloni's ex-

* Draper found when the intensity of the green and lower half of the blue rays was diminished, that they *aided* the action of daylight; if increased, they diminished it. So that these rays, when *of certain intensity*, have a chemical action like the red and orange rays! The only difference being, that increased intensity acts in an *opposite way* on these latter rays from what it does on the green and blue. All this, again, favours the opinion of "convertibility," and, as was to be expected, of rays at opposite ends being converted *differently* by the *same causes*.

* It must, however, be observed that these experiments were made on an iodized silver plate. It is also to be borne in mind that in another part of his "Essays," Möser says, in reference to the *blackening* by *long* exposure to the sun's rays of the silver plate already noticed, that "Blue and violet light, and partly the green, are capable of performing the same thing." Perhaps these different results of the same coloured rays are to be explained by reference to Professor Draper's experiments on the effect of different *intensity*, already noticed. At all events, further experiments are wanting on this subject.

periments appear to be more reconcileable with each other than with those of the writer in question; but further, this latter writer having continued at intervals his experiments, writes ten years afterwards (viz., 1854,) "It is certain that some principle has permeated the (blue) glass or fluid, which has a VERY decided thermic influence."* He has thus clearly found out, by further experiment, that Melloni was right, or at least that his own experiments in 1843 were conducted on an erroneous supposition; and yet, in 1854, he has not the candour or the industry to correct this error, but still heads his chapter against Möser's views as "Thermography," and *reprints* his essay of 1843 without any correction. No doubt it is often far easier to *re-write* an essay than to correct it (when, as in the present case, many corrections would be necessary); but still, in justice to those who might not have leisure to discover the difference between the former and latest experiments detailed in his book, he should have stated this discordance; but so far is he from doing so, that his attack on Möser in 1843 stands as it was written; or at least instead of pointing out his own error, he talks in 1854 of "the *absurdity* of all this" (p. 255); a pretty compliment to Möser, and which Möser might justly apply to his own erroneous conclusions as to the effect of different coloured glasses on the Möser images. From the note lately made, it will be clear that I do not profess to support Professor Möser in *all* his conclusions, nor to decide at present whether he be right or wrong in concluding that the radiations which produce his images have the power of "levelling" or obliterating the images produced by the solar rays (Daguerre's images); or, 2ndly, "that visible rays are not capable of destroying images produced by those which are invisible." My opinion is that these points also want further experiment; but I may observe, that as it is clear that rays at the opposite ends of the spectrum have different effects, Möser may be perfectly right in supposing that the blue or dark rays tend to destroy any images made more especially by the red—even as far as the yellow—rays. But, on the other hand, those experiments made with blue glasses certainly require to be repeated and varied, in order to prove that the radiations concerned in the above results are heat, and not, as M. Möser, with more probability (as I think) supposes the most refrangible (even the invisible) radiations. Möser, indeed, somewhat improperly perhaps, called these "invisible light;" but such improper names do not alter the good facts he discovered, and by the above terms he made his *meaning* perfectly intelligible, the first of all considerations in these abstruse points.

We are told that blue glass left half an hour on polished copper caused no impression, while red glass did. But then, even supposing this experiment correct, it is to be observed, we are told further on, that mica left on the same plate made no impression. Now this at once should have made the author doubt whether the red glass had acted by transmitting *more heat* than the blue glass.

Again, like myself, he finds that no images are formed when glass, and I may add mica, are interposed BETWEEN the object and the copper-plate. I have found this to be the case even when the under side of the plate *is strongly* heated. Here, then, is *absolute proof* against the "Thermography" theory; for you by such means increase the heat to an enormous extent beyond what can be done by merely letting the sun shine on red and blue glasses on the plate; and, according to Melloni, more heat is transmitted by the blue glass; but whether or not, there cannot be any *very* great difference in this respect.

Again, when mercurial vapour was employed to bring out the images, we find the order was as follows: "Red glass, mica, orange glass, paper, charcoal the coin, blue glass;" all these objects having been exposed on the plate to "fervent sunshine." But this is equally against the heat theory; for, in this case, we find mica, second in effect, yet, in the first series of experiments just stated it was last in effect, or "left no impression." It is astounding to find directly afterwards these experiments urged, "as DISTINCTLY PROVING! that the *only!* rays which had any influence on the metal were the calorific rays." Further on, "blue and violet glasses could not be detected as leaving any evidence of action." Now this assertion, as we have seen, is directly contrary to Möser's results, and also indirectly to Melloni; and hence there is strong reason for believing these are merely results *supposed* to have been obtained, a consequence apt to occur, when, as in the present case, an author makes experiments, having a strongly *preconceived* theory (viz., heat rays) in his mind at the time. That this has vitiated all the results, is clear from the next set of experiments with coloured *fluids* in bottles laid on the copper-plate; for we find, he says, the largest deposit of mercurial vapour was found under "the red fluid, the next under the blue, then under the green, then yellow, then white, then

* "On Light," p. 214. Longman, 1854.

black."* Thus we find the blue fluid here *second* in order, or against his own theory. Again, Melloni, as stated, makes "white glass transmit 40, red glass 33, and violet 3½ parts of heat rays out of 100" (Thomson *On Heat*, p. 134.) Now, all this is directly opposed to the above, in which we find white glass the last but one! and as Melloni seems to have had no preconceived theory, I much prefer his results. But I also maintain the very experiments of the author in question are *wholly irreconcilable* with his own theory. He tells us in the "Introduction," and in a note on Möser's images, that his "varied occupations have prevented his pursuing these investigations;" then, as all the experiments want repeating, he ought not to have incorporated an essay written ten years ago, replete with experiments on coloured glasses and *media the* EXACT *powers of which in transmitting radiant matter of different kinds are even yet very doubtful*,† into a work published in 1854, and which contains some later experiments that even contradict those made years ago, and now again, without further labour on the subject, is incorporated here. If "varied occupations" prevented careful reconsideration of this difficult subject, he ought not to have again published results obtained ten years ago, and obviously in great part inconclusive as "decidedly proving" (his own words!) any thing on the subject. The Section on Möser's images, full of illogical inferences in 1842, remains without correction in a new work published by Messrs. Longman in 1854! It is not by such negligence or indifference as this, that the laborious inferences of Möser are to be upset; and hence Möser was probably right when he accused him, as he says, of "claiming as his own all the published experiments, particularly the above." At all events, the attempt to introduce the new word "Thermography" as the expression of Möser's images, was much like an attempt to stamp or "write" his own name on the discovery of another; and the absurd part of the business is, that he is not even *near* proving that Möser's images are caused by the heat rays—more particularly by these alone, as he so decidedly asserts.

That these experiments require repetition is clear from the statement, that whether under sunshine, or "five hours in the dark," the image under the red glass was the strongest; and even admitting it to be correct, that this glass lets most heat pass under a *strong sun* (contrary to Melloni and Möser's views) still, it does not hence follow, that it should let most pass in the dark, since Professor Draper's valuable experiments, already alluded to, show that INTENSITY of light or heat has a great effect, at least on Daguerre's images. Besides, when in 1843, he made the above experiments, Fizean had not made his, which trace *some* effect certainly in the production of Möser's images, to the *very* fine particles of dust, &c., always floating in the air, and which source of fallacy was not guarded against when this "red glass" was used. As, however, others may wish to repeat these experiments, it may be stated that it appears *tolerably* correct to admit, that red glass and fluid* (although they allow probably as much heat to pass as blue glass, &c.), yet obstruct most of the light and chemical rays; that the blue obstructs also much of the light, but lets the chemical rays pass; and that yellow abstracts the chemical, but lets the light rays pass.

These remarks on colour lead me to state, that more experiments seem wanting as to how far light affects different simple or compound bodies, in consequence of their very nature (so to speak), and how far solely on account of their colour; since we have seen above that the colour of a body may sometimes vary, and its composition remain the same. Chlorine, for instance, is remarkably sensitive to light. Is it possible to decide how far this is in consequence of its *yellow colour*, and how far on its very nature as a simple body?

"Dr. Daubeny, in England, and Dr. Gardner, in America, both conclude, from their experiments, that the decomposition of carbonic acid increases with the increase of light, and that *it is more rapid under the yellow ray than under any other*." Now, as we here observe that the most extraordinary of all chemical decompositions is not affected by the violet or "chemical rays," this will

* These had been exposed to bright sunshine an hour; and he tells us the result was exactly the same when the bottles were left *in the dark* for five hours on the plate. When the copper plate was placed one-eighth of an inch *above* the bottles, five hours in the dark, on exposure to mercury, the red glass affected the plate most, then *the blue* and green; *the others not at all*. Now these experiments want repetition; but, as the blue was the *second* in order, are still much against the "thermography" theory; though, strange to say, he does not notice this! As, according to Melloni, green glass obstructs heat rays so well, why should this be third; and white not at all?

† Indeed, he himself admits this at p. 213. He says, "*We only arrive at approximations to the truth by the system adopted;*" and that the prism is the only plan "to secure complete isolation of the rays." Now, after such admission, is it not "absurd" to find he has not *re-written* his chapter against Möser's theory, in which he hints at *its* "absurdity," and considers his own experiments as "*distinctly proving!*" (p. 258) heat to be the SOLE agent concerned in these phenomena.

* Solution of carmine in super-sulph. ammoniæ is the red *fluid* that acts most like to ruby glass; and solution of cupro-sulphate of ammonia, like blue glass.

be sufficient to convince most persons that, although it be barely possible that these rays are different from those of light, yet that they have no claim to be called "widely different" (p. 369), and consequently that such an assertion is as completely unsupported by sound experiment as that of Möser's images being solely dependent on heat. As Professor G. Forbes has shown the great mass *even of fish* cannot live without light, it is clear that this agent is perhaps the strongest chemical agent of any, for it is essential to the chemistry of *living matter*.

In regard to "convertibility," I may state, that though heat seems convertible into light, and perhaps other force, yet that light does not seem convertible into heat. I infer this from Melloni's and Forbes' experiments, who were unable to produce sensible heat, although they concentrated the rays of the moon several thousand times. In phosphorence, too, artificially produced, or existing naturally in the glowworm and other insects, we observe that light exists without any appreciable heat.

By burning a mixed jet of oxygen and hydrogen, we get the greatest heat, yet very little light—"light being little," as an eminent chemist says, "because there is little *solid* matter burning."

CRANSTOUN'S RAILWAY COUPLING APPARATUS.

ATTENTION having recently been drawn to a new system of connecting the rolling stock of railways, the invention of Mr. C. Dalrymple Cranstoun, manager of the Morayshire Railway Company, we propose to lay a description of it before our readers. The Morayshire line is the only railway upon which the system has, as yet, been applied, but it is thought very highly of by many railway engineers and others. It is certain,

Fig. 1.

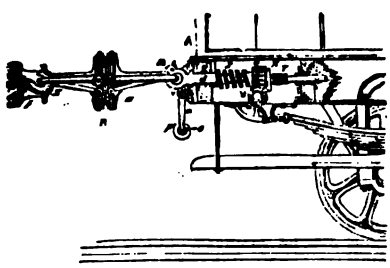
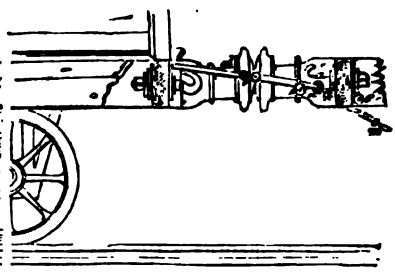


Fig. 2.



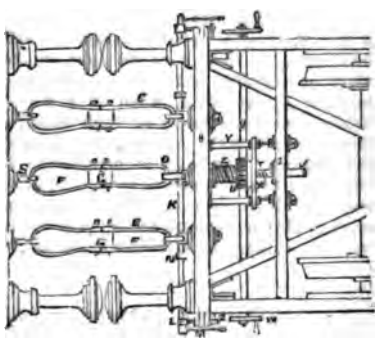


Fig. 3.

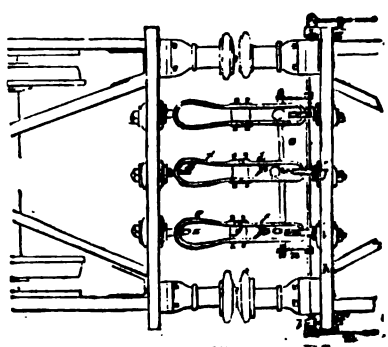


Fig. 4.

at least, that at a small expense the danger of the present method of coupling and uncoupling carriages (which results in the death of about fifty men, annually) may be altogether avoided.

Fig. 1 is a side elevation, partly in section, of part of one end of a railway carriage, as fitted with Mr. Cranstoun's improved coupling and uncoupling gear, and as connected to another carriage. Fig. 2 is a similar elevation of a railway wagon, as fitted with the improved coupling and un-

coupling gear, as connected to another wagon. Figs. 3 and 4 are plans, corresponding respectively to figs. 1 and 2, representing only the framing and coupling details of the carriage and wagon. The coupling of the carriage, A, with the adjoining carriage, the end of which is represented at B, is effected by means of three engaging links, C, D, E. Each of these links is composed of two horse-shoe pieces, F, each connected to a central short joint link, G, by pins, passing through eyes in their extremities and through the joint link, G. The outside engaging links, C, E, are connected to the framing, H, of the carriage, A, by being passed through eyes in staple links, I, bolted to the frame; the central link, D, is similarly passed through an eye in the end of a draw link, J, which passes through the frame to the tightening mechanism behind. Immediately beneath the links, I and J, is a horizontal shaft, K, carried transversely in bracket bearings, L, bolted to the carriage framing. Lever handles, M, are fixed upon the extreme ends of the shaft, K, outside the carriage framing, and in a convenient position for the attendant, and the shaft has fixed upon it, just outside the links, C, E, two levers, N, which carry a parallel rod, O, at their extremities, arranged so as to lift the links, C, D, E, when the shaft, K, is turned. Guide pieces, P, are fixed upon the rod, O, and these entering within the links, C, D, E, prevent them from swinging to either side whilst being lifted. The links are prevented from being thrown up too high by pins, Q, passed through the links, I, J, in suitable positions for the purpose. The eyes of the horse-shoe portions, F, of the links, C, D, E, are formed with angular shoulders, R, which prevent the links from folding or doubling down when lifted, and enable them to be raised in a rigid condition above the hooks, S, of the adjoining carriage. The links, however, can be angled a little in the opposite direction to suit the slight variations in the distance between the carriages, but shoulders are formed on the upper sides of the link eyes to prevent the links from being flung completely over when being lifted, these last shoulders not being so prominent as the lower shoulders, R. The draw link, J, as already mentioned, projects through the frame, H, and has a screw thread formed upon it at T, to work in a nut, U, formed externally as a worm wheel, into the teeth of which worm wheel gears a worm upon a horizontal shaft, V, passing transversely across the carriage and through bearings in the side frame timbers. The shaft, V, has hand wheels, W, fixed upon its overhanging extremities outside the carriage framing, and in a convenient position for the attendant, who, by turning the hand wheel, can slacken or tighten up the link, J. The worm wheel nut, U, is held on one side by a cross piece, X, fixed upon a pair of stays, Y, bolted to the transverse end frame-piece, H, and to an inner transverse frame-piece, Z, through an eye, in which last the link spindle, J, is also passed. A helical spring, Z, is placed on the link spindle between the frame-piece, H, and the worm wheel nut, U, and allows the draw link to yield to jerks or extra strain. The other end of the carriage may either carry plain connecting hooks, as at S, or both ends may be fitted with the engaging links, the staple links from which the engaging links are suspended being in that case all formed with hooks.

The coupling gear, represented in fig. 2, between the wagon ends, *a* and *b*, is the same as that between the carriage ends, A and B, as in fig. 1, except as regards the central draw link, *j*, which in the wagon is simply fixed to the frame-piece, *h*, like the staple links, *i*, instead of being provided with the tightening mechanism, as employed with the carriage coupling. The letters appertaining to the carriage coupling gear are capital letters, whilst those on the wagon coupling gear are corresponding italics. In figs. 1 and 3, the carriages are coupled together, and with the central link, D, tightened up; whilst in figs. 2 and 4, the links, *c*, *d*, *e*, are represented as raised, by means of the handle, *m*, the shaft, *k*, and the rod, *o*, into the position in which they are clear of the points of the hooks, *s*, of the adjoining wagon, *b*, which is accordingly free, and can be removed. After removing the wagon, *b*, the links, *c*, *d*, *e*, may either be allowed to drop into a vertical position, or a pin, *z*, may be placed across the lever handle, *m*, so as to keep the links in their elevated position until another wagon is brought up to them, when they may be dropped upon the hooks of such wagon by merely releasing the lever, *m*, thus coupling the wagons. The joint or connection between the two horse-shoe pieces, F, of the engaging link may be constructed in various ways to obtain the same action as is secured by the shoulders, R, as before described.

MR. BESSEMER'S DISCOVERY.

BY W. TRURAN, ESQ.

Author of "The Iron Manufacture of Great Britain."

In common with many others, I have read with some interest Mr. Bessemer's description of his process for making iron and steel without fuel. A hasty perusal of the

paper sufficed to show some serious gaps in the description, which I had imagined the inventor would have filled up ere now. This has not been done, and I would therefore offer a few remarks thereon.

In the first place, I must premise that the combustion of the carbon in fluid iron ran direct from blast furnaces and exposed to the action of a blast of atmospheric air, is no new discovery. In my work on iron manufacture, published last year, I described the numerous small jets of blast blowing into the liquid iron in the old form of refinery furnace; the combustion of the carbon of the iron by the blast; the intensity of the heat produced, as exhibited in the fusion of the sandstone bottom used; and other details, theoretical as well as practical, of the process for refining iron by air blasts. Added to this, the intense heat produced by blowing strongly into liquid iron holding carbon in mixture or combination, is well known to intelligent refiners; therefore Mr. Bessemer's assumed discovery of a great principle resolves itself into the re-publication of matters previously well known to a numerous class of operatives.

Mr. Bessemer's improvement — if improvement it can be called—consists in shortening the refining operation, so as to complete it with the heat given out by the combustion of the carbon of the liquid iron. This is now admitted by his friends to be the only novelty in his process. The entire blowing lasts only thirty or thirty-five minutes; in the ordinary blast refinery it occupies about two hours, and the continuance of the excessive temperature for that period is ensured by covering the metal with coke or charcoal. This covering of the liquid iron by a carbonaceous fuel is essentially necessary to refining by blast, in any form whatever. Mr. Bessemer states that at the maximum temperature a portion of the oxygen of the blast combines with the iron which undergoes combustion, and is converted into an oxide. This oxide, we are seriously told, is no sooner formed than it is again fused, and forms a powerful solvent of the alloyed earthy bases. These statements do Mr. Bessemer no credit. They are in direct opposition to all principles of chemical science, and reflect severely on those who have eulogised the plan as being in accordance with sound philosophical principles. The newly-formed oxide of iron cannot be fused at any temperature whatever, other than by depriving it of its oxygen. This is accomplished by bringing the oxide in contact with solid or gaseous carbon. Mr. Bessemer professes to use no fuel; therefore, the fusion of the oxide in the manner he describes is a direct impossibility. In the common refinery, by far the larger portion of the oxide formed ascends, and meeting with the stratum of fuel, is again reduced to the metallic state, and falls back into the mass. If the metal is insufficiently covered with incandescent fuel, the oxide is unreduced and, passing violently upwards with the stream of gases, escapes from the chimney as small globules of magnetic oxide, alloyed with silica and other earthy bases. The shower of sparks described by Mr. Bessemer are merely those small globules of oxydised iron, the escape of which is attended with a direct loss of yield. Hence, before he succeeds in the production of a refined metal fit for manufacture into wrought-iron bars at a cheap rate, the inventor must adopt this feature of the old plan, when his apparatus resolves itself into a very common refinery.

Mr. Bessemer committed a great mistake when he claimed for his plan the production of that quality known as charcoal-iron, simply from the refining being conducted without contact with mineral fuel. A superficial acquaintance with the subject would have shown that the quality of the fuel used in the manufacture of a moiety of the bar-iron, so far as regards the usual contaminating ingredients, sulphur and phosphorus, has nothing to do with the ultimate quality of the bar. In the puddling, boiling, and heating furnaces, the fuel is kept separate from the iron; where the refinery is employed, the earthy matters of the fuel pass into the cinder, but the gaseous constituents, from being cooled above the liquid iron, have very little influence on the quality of the product of such fires as receive the iron direct from the blast-furnace. Charcoal-iron is a product of the blast-furnace, and cannot be produced in any subsequent stage of the manufacture.

I cordially agree with Mr. Sanderson, that the iron, after treating by Mr. Bessemer's process, possesses the qualities neither of wrought iron nor cast steel. I will not trouble you with extracts from my work bearing on this point, but would remark that malleability is a property never yet communicated to iron at varying temperatures, other than by manipulation in some one or other form. The mere removal of a portion of the impurities with the iron by fusion does not, of itself, convert cast into malleable iron. Castings with a slight degree of malleability, at low temperatures, are common in this country and abroad; at high temperatures they lose this, are equally brittle with other cast irons, and are utterly devoid of the welding principle.

Mr. Bessemer estimates his malleable cast ingots to lose 5½ per cent. in the finishing rolls. How can pure malleable iron, as he asserts the ingots to be, lose so much in

the mere rolling to a bar? If it is thus reduced in weight more than 1 cwt. per ton, the action of the rolls must squeeze out of the so-called pure iron a very large quantity of cinder. In ordinary rolling, the loss of weight in these rolls amounts to no more than 15 lbs. or 16 lbs. to the ton.

Mr. Besseiner heads his paper "Manufacture of Iron and Steel without Fuel," whereas it appears to be a proposition for making wrought iron and steel from liquid cast iron. I say a proposition, because it is not yet known that a process exists for making either. No one has seen the malleable iron equal to charcoal in point of quality to be made by the means described from common irons; there has not been any made and forged into articles to demonstrate the correctness of the patentee's statements. The cast steel of excellent quality, which it is to produce as cheap as finer's metal, has yet to be made, and exhibited in the shape of articles of cutlery, as a test of quality. A few pieces of refined iron were displayed at the meeting, but these were no more like bars of wrought iron or steel than chilled cast iron is like tempered steel. I see chemists and others apparently delighted at some discovery, but the evidences of this discovery are wanting, and until they are forthcoming no one can affirm that there has been any made. Nevertheless, I shall be glad to hear that Mr. Bessemer's description of his invention is more faulty than the process itself.

SMITH'S IMPROVEMENTS IN WORKING PLOUGHS.

Mr. W. Smith, of Little Woolstone, Fenny Stratford, Bucks, has recently patented an invention which relates to ploughs and other cultivating implements, which are put in motion when in use by steam or other power actuating a barrel or barrels on to and off which ropes are wound. His improvements have for their object means of turning a plough or cultivating implement at the end of its course. For this purpose he arranges the fore part of the plough or other implement in such manner that the two ends of the ropes used may be both attached to the fore part of the plough or implement, and so that the end of the rope which is next to come into use as the draft rope of the plough or implement shall, by the working of the engine or power, first act to turn the plough or implement, and the end of the rope previously acting as the draft rope shall pass from the front as the plough or implement turns into position; and this is accomplished by having the coupling by which the two ends of the ropes *are attached* formed with three points of draft: one (the forward one) for the moving the plough or implement forward, and two side ones (one for each rope) into which respectively the two ropes alternately pass as the implement comes to the end of a course, and the end of the rope which for the time being has been out of action by acting on one of the side points of draft, causes the plough or implement to turn when it arrives at the end of a course, whilst the rope which has been acting as the draft rope passes from the front to its side point of draft, and remains there out of action till the plough or implement has again completed a course. Another improvement consists in applying to such description of ploughs or implements a leg or support which is ordinarily above the land, but when the plough or implement comes to the end of a course, the leg is lowered so as to come on the land, by which the hinder part of the plough or implement is raised out of the land, and then the plough or implement is turned on the leg so as to come into position by performing a return course.

THE MANUFACTURE OF UMBRELLAS.

There are very few objects of utility, the improvements and the manufacture of which have made more rapid strides than that of the umbrella. Formerly, that which took a long course of tedious and divided labour, often attended with the most provoking inaccuracy and consequent loss, is now done with a marvellous rapidity and an adherence to unerring exactitude. The machines worked by Mr. Rubery, of Birmingham, have principally tended to this desirable result. These machines are very beautiful, and like all successful efforts of well directed mechanical genius, are extremely simple in their construction. It would be scarcely a proper return for the courtesy of our *entré* into the factory, to describe them in detail, but we may venture to say that they do perfectly, by the superintendence of one boy to each, what was formerly inefficiently done by many adults. These and other equally important aids have given eminence and precedence to this manufactory for all descriptions of "umbrella furniture," which leaves this locality to assume the names of a countless number of makers throughout the world. Even now, amongst the most barbarous tribes, the extent of the business, in parasols alone, may be guessed at, when it is added that *several tons* of the little hinges, which permit of their handles to fold, are here struck every year.

FRANCIS'S METALLIC BOATS.

Mr. Francis's corrugated metal waggons, which were described and illustrated at page 193 of our Number for August 30 (No. 1725), and were last week submitted for trial before the authorities of Woolwich Arsenal, have been pronounced of so satisfactory a nature by them that they have expressed their decision of urging the Government to decide on their introduction for all the purposes to which they may be applied. Sir George Pollock, Sir Frederick Abbott, Major-General Brooke, Colonel Tulloch, any many other scientific officers have expressed their opinion that if the metallic waggons were introduced into our public services they would prove of incalculable value. Mr. Francis is about to proceed to Vienna and St. Petersburg, having received invitations to attend from the Austrian and Russian Governments.

HIGH-PRESSURE STEAM FOR MARINE PURPOSES.

On Thursday an interesting trial took place at the railway foundry, Leeds, in the presence of the Government inspector, and other scientific persons, of a novel application of locomotive high-pressure machinery to marine purposes. The machinery, which has been arranged and completed from designs of the engineer of the works, is intended, we understand, for a screw steamer recently launched at Hull. Nothing could apparently be more admirable than the smoothness and facility with which the machinery worked, a speed of 120 revolutions of the screw shaft per minute being obtained from the direct action of the engines, without the intervention of multiplying gear. This quickness of piston motion, which is not attainable at low pressure, is one of the main advantages of the application. Another is the great saving of space and weight, amounting to more than one-half. But what seemed to excite admiration most was the ease and quickness with which the motion was reversed, which on Thursday was repeatedly effected under unfavourable circumstances, and against the full steam pressure of 140 lbs. on the inch, seven and eight times within thirty seconds. Upon the whole it is not too much to say that this very admirable arrangement bids fair to supersede all other applications of steam power to marine purposes, especially for screw steamers.—*Leeds Mercury.*

FOREIGN INTELLIGENCE.

Scientific, Engineering, Architectural, &c.

Naples.—The budget of the current year exhibits a sum of 3,800,000 ducats (£600,000) for the Department of Public Works and Useful Institutions. The city of Naples is to be enlarged by the new streets which will connect the Posilippo with the Vomero, and the completion of the street de'Fossi to Ponte Nuovo. The tunnel also, which will lead from the district della Vittoria to St. Francisco de Paola, opposite the royal palace; the Vittoria street, the embellishments at the Riviera di Chiaja, as well as the completion and vaulting of the Carmignano Canal, which supplies Naples with good drink water from a distance of 42 miglia, deserves to be mentioned here. Besides the building of roads, which is carried on with great energy all over the land, the improvement of the harbours of Miseno, Bari, Trani, Gallipoli, and Brindisi, deserves to be mentioned. Some of these harbours have been of great importance in the times of the Romans. The two projected lines of railway also deserve notice. One will go to Brindisi, and the other through the Abruzzi. Another portion of the latter, from Sarno to St. Severino, has been lately completed. The draining of the soil, as well as the cultivation of forests, receive adequate encouragement.

The Steamboats on the Danube.—The effectual *liberation* of the Danube has been effected, as English and French boats have begun to ply between Tultcha and Isaktcha. The hitherto monopoly of the Austrian steamers enabled them to charge extravagant fares, now reduced. Hitherto the passages of the above vessels were delayed, by the want of knowledge of the soundings, and the want of coals. Still, the many coal measures scattered on the Serbian banks of the Danube will, if worked, yield great advantages to any mining company. They would be able to erect some fine wharfs on the Save, near Belgrade, already planned. Other important landing-places are also abundantly to be met with.

[*Communicated by* Dr. Lotsky.]

Report of the Commissioners of Patents (of America) for the Year 1854. *Arts and Manufactures.* Vol. I., text; Vol. II., plates. Washington, 1855.

These two volumes deserve particular attention. Mr. M. C. Gritzner, of America, conceived that the annual reports of the American Patent-office would be greatly

enhanced in value if the whole of the abstracts of the specifications for the year were illustrated by a volume of carefully executed engravings. He accordingly proceeded to carry out his view, and has put forth the above volume, which deserves the highest praise. Mr. Commissioner Mason has accorded to it his warm approbation, and expresses his regret that he feels his inability to carry out the plan for the future. We do not, however, consider that the system of publishing abstracts of the specifications of patents, and reduced representations of the drawings accompanying them, would be so useful as the method now carried out at our English office—that of publishing the specifications and drawings in full in separate pamphlets. On the contrary, we hope before long to find the American, French, and other Governments imitating our own arrangement in this respect. Apart from this consideration, however, Mr. Gritzner's effort is a highly meritorious one.

A Practical Treatise on Cast and Wrought-iron Bridges and Girders, as applied to Railway Structures, and to Buildings generally; with Numerous Examples, drawn to a Large Scale, selected from the Public Works of the most Eminent Engineers. By W. HUMBER, Assoc. Inst. C.E. Part I. London: E. and F. Spon, 16, Bucklersbury.

THIS is the first part of a work which is to be completed in about twenty parts. Judging from the letter-press before us, we are disposed to think that Mr. Humber writes rather hastily, and without sufficient system. It is scarcely fair, however, to judge from the few pages at present before us. The lithograph illustrations are prepared with great care, and furnish ample details of the structures described—the Stamford-bridge viaduct of the East Riding branch of the York and North Midland Railway, and Mr. Ashcroft's railway bridge over the Stour. We shall look with interest for the future parts; for the treatise, if well proceeded with, will be a very valuable addition to our engineering works.

DECIMAL COINAGE, MEASURES, AND WEIGHTS.

To the Editor of the Mechanics' Magazine.

SIR,—As the method of measuring quantities by units decimally related to each other is now attracting a great deal of attention, I hope you will allow me a little space to explain a system that I think is well calculated to suit the wants of England and her colonies. I have tried a great many systems, and the one I propose comes the nearest to what I have been seeking for, viz., one that should give a maximum of advantages with a minimum of change. By way of distinction, I propose to call it the "Victorian" system, and then, when spoken of as such, there can be no mistake.

By your leave I will in succeeding numbers endeavour to fully develope the system, and be as brief as the subject will allow.

I am, Sir, yours, &c.,

J. SIMON HOLLAND.

August, 1856.

ON THE CONNECTION BETWEEN A DECIMAL SYSTEM OF COINAGE BASED ON THE SOVEREIGN, AND THE PROPOSED VICTORIAN SYSTEM OF DECIMAL MEASURES AND WEIGHTS.

1,000 cubic inches of water at the temperature of 62° Fah., or 16·67° centi. weigh 252,458 grains. 1,869 sovereigns weigh 40 lbs. troy = 230,400 grains. From these we find that 4,000 sovereigns weigh 1953·18791 cubic inches of water, at 16·70° centi. If this bulk of water be taken at 16·5° centi., and be reduced to cubic eighths of an inch, we shall have 1000005·23526. The cube root of this is 100·00017451 nearly. If we add 4 eighths of an inch to the length of our present foot rule, and make it to contain 100, it will differ from the "Sovereign" foot by 0·00017451 of the eighth of an inch, being about *one-tenth of an inch in a mile.* In all that follows we shall consider this difference so trivial, as not to be worth notice in our exposition of the system.

The cube of this will give us a bushel containing 1953·125 cubic inches, the present bushel containing 2218 cubic inches. This bulk of water will weigh over 70 lbs.; this divided into 10,000 grains will give the Victorian grain = 2·03 old grains. The Victorian ounce will be equal to 1·127 avoir. and 1·027 troy ounces. The sovereign will then weigh *exactly* a quarter of an ounce, and the Mint price of gold will be *exactly* £4 per ounce, and 4 mils per grain.

If the above found length be taken as a fundamental unit of measure of length, surface, capacity, and weight, we shall have the following advantages.

As to length. We shall not disturb the manufacture of the millions of articles now measured by the inch and the eighth of an inch. Every board, bar of iron, rope, chain, &c.; the millions of bolts and nuts screwed with Whitworth's thread, every part of the steam engine, and other machinery, will still be measured as before, and, what is of more consequence than everything else, the workman will still have a rule that he can conveniently use and carry in his pocket. In one respect it be will better, as

it will give a little larger radius, or scale for the logarithms on the slide. 10,000 of these feet, which we propose to call "Peds," will give a mile measure of nearly two of our present miles, or 1·973. Of these miles we shall have

Diameter of the earth	=	4010·45
Circumference	„	„	„	12599·2
Quadrant	„	„	„	3149·8
Degree	„	„	„	„	35·998

As to surface. We shall have a Victorian rood = 0·997 old rood, and also = 1·007 French decares. 1·974 French arpents d'ordonnance, and 1·981 Scotch acres will equal 10 Victorian roods.

As to capacity. Whenever we have the length, breadth, and depth in peds of any bulk of grain, or liquid, we shall have the exact number of bushels, or gallons, without any more figuring.

As to weight. Every table of specific gravities will then become a table of the exact weights of cubic peds, and of the divisions and multiples of a ped. A cubic foot of water now weighs 62·32106057 lbs. avoir. or 997·137 ounces, nearly, and not 1000 oz. as often said to do. The volume of every pump, pipe, tank, reservoir, or warehouse floor, expressed in cubical measure, will also give the measure in gallons, bushels, lbs., &c.

ON THE CONSTRUCTION OF ARCHES.

To the Editor of the Mechanics' Magazine.

SIR,—It is due to your correspondent, "J. E. D.," to acknowledge his explanation of the *modus operandi* of setting arches, the joints of which are not in the line of radius; and when opinions on practical subjects are freely offered, and space for them kindly given in your Magazine, your readers derive all the benefit of judging, by comparison, of the practicability, or otherwise, of any given project. Now, with regard to the diagram in *Mechanics' Magazine*, No. 1722, it is a mistake to expect any resistance from such an arch in the event of a pressure of water beneath; for although the joints of the key stone may not break, yet the joints of the stones on each side of the key stone most certainly would; and if the pressure increased, the crown of the arch would be completely thrust out, unless the superstructure or roadway presented sufficient impediment. Respecting the construction of such an arch, I think that very few builders would attempt "J. E. D.'s" plan of centreing; it is unscientific and impracticable where there is much length of waterway; and the striking of such a centre would be attended with some danger, for the stones could not be said to be set in their proper position, but merely laid down, and expected to settle in their place as the centre is struck. The construction of an arch intended to carry a limited superstructure above it, and at the same time required to resist an upward thrust, is a subject that has occupied the attention of scientific men of this and other countries, although with very little practical success; and any attempt to elucidate the subject is deserving of attention, as there are many cases where such a construction is necessary; as, for instance, a watercourse under a roadway, or the basement floor of a water-mill, and many other situations where there is not sufficient space to load the arch above. Hence, the practice generally in such cases is to give extra attention to the spandril of the arch, that it be filled in with courses of brick or stone, slightly curving from the extradus of the arch to the abutments, instead of filling in with level courses; and much resistance could also be gained by an inverted course of brickwork of as much curvature and thickness as the limited space above will allow, before making up the roadway or floor. If it were desired that an arch should be built with dovetailed instead of radiating joints, the better plan would be to construct the centre of the same form as the intended arch, and after the stones are lowered on the centre, to slide them horizontally to their place. I think "J. E. D." will agree with me, that this would be preferable to making a centre high enough in the crown to allow for settling afterwards; but even in this case, with the best masonic accuracy, there would not be that rigid stability that is obtained by radiating joints.

I am, Sir, yours, &c.,

F. P.

Sept. 8, 1856.

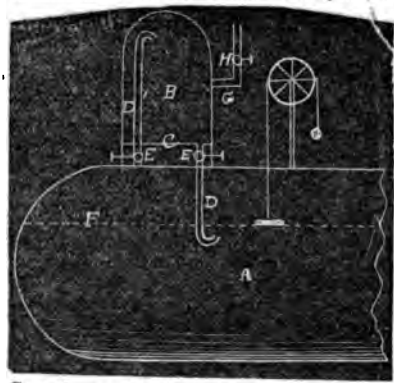
APPARATUS FOR FEEDING HIGH-PRESSURE ENGINES.

To the Editor of the Mechanics' Magazine.

SIR,—Being a subscriber to your valuable Magazine, I beg to forward for your consideration the accompanying plan for supplying high-pressure engines with water, without the necessity of force-pumps, worked either by the engine itself, or by a subsidiary donkey, and thereby causing a great economy in steam, &c.

Let A be the boiler, B a dome-shaped cylinder on the top of the boiler, but with a strong partition, C, above the boiler (about 6 in.) D, D, are two tubes, one reaching to the top of the cylinder, or nearly so, and one from the bottom of the cylinder to below the level of the water in the boiler. E E

two stop-cocks between the partition and the top of the boiler, which close the communication between A and the cylinder.



G a tube opening into the side of the cylinder to supply it with water, but closed, if wanted, by a tap, H.

It is obvious that if the cylinder be filled with water through the pipe, G, and then the cock, H, shut, and the cocks, E E, opened, the steam rushing up the tube, D, will force the water down the pipe, D, and so supply the boiler, all that will be wanted will be to fill the cylinder occasionally with water by an ordinary pump, or by any other means.

Should the water in the cylinder condense the steam rushing up the tube, D, all that would be necessary would be to place a hollow floating cylinder, made of copper, on the top of the water, with a hole to slide up and down the pipe, D, though I fancy that the heat from the boiler would, in a great measure, warm the water in the cylinder.

Hoping that it will be worthy of insertion, believe me to remain,

Yours faithfully,

OPIFEX.

Donisthorpe, near Ashby-de-la-Zouch, Leicestershire, Sept. 3, 1856.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

OUDRY, C. F. L. *Certain improvements in the preservation of metals and other solid substances.* Dated Jan. 12, 1856. (No. 91.)

This invention consists in the application, by electro-deposition, of copper or other metals on iron, zinc, and other metals and their alloys, and also upon wood, paper, cardboard, and stone, having first covered them with an isolating coating of a composition susceptible also of preserving, waterproofing, and metalising them, and which coating is a conductor of electricity.

EMANUEL, H. *Improvements in the manufacture of spoons, forks, and other similar articles in metal.* (A communication.) Dated Jan. 12, 1856. (No. 92.)

This invention consists in engraving or otherwise figuring upon a pair of dies, the surface of each of which is in the form of a segment of a circle, the form or device required to be upon the article to be produced, and in mounting such dies in suitably-shaped frames or holders; in setting such dies opposite to each other, that is, one above and the other below, and in imparting to each a rocking motion which brings the whole surface from end to end of each die in contact at every stroke or motion of the pair of dies.

OWEN, W. *Improvements in the manufacture of railway wheels and tyres.* Dated Jan. 12, 1856. (No. 93.)

This invention consists—1. In certain improvements of bell clutch and rolling-machinery for getting both the inside and outside surfaces of tyres true before being shrunk on to their wheels. 2. In arrangements of machinery for finishing tyres when on their wheel and in a heated state by rollers, whereby the outer skin of the tyre is preserved, and the metal improved by the pressure it receives from the rollers.

TOLHAUSEN, A. *Certain improvements in balanced slide valves for steam engines.* (A communication.) Dated Jan. 14, 1856. (No. 96.)

In carrying out this invention the back part of the valve is fitted into the inner face of the back of the steam chest, between which face and its seat it works steam tight. The first improvement consists in a method of compensating for the wear of the valve, the seat, and the back of the steam chest; and the second consists in means of balancing the valve.

HOMERSHAM, W. C. *Improvements in machinery for the preparation of hemp, flax, and other fibrous materials.* Dated Jan. 14, 1856. (No. 97.)

The mechanism for crushing and beating consists of a series of independent pairs of horizontal fluted rollers, every succeeding pair being driven at such a speed as to cause the material to be delivered less freely than by the pair preceding them, thereby obviating the tendency to break the fibre by tension. By this means a kind of cushion of the material is formed on the board, or endless web, which conveys the material from one pair of rollers to the next, and the material in this position will be acted upon by means of canes or beaters, which impart an elastic blow by means of cams and springs, in order to imitate the action of hand-caning. It may be found desirable to

combine with this mechanism a suitable blowing apparatus. For the scutching process a set of beaters is employed, mounted so as to operate as the vanes within a case similar to the ordinary blast fan, the front of such beaters being made to act on the striking boards, which are adjustable. By the revolution of these beaters or fans there is combined with the beating action a strong current of air, which assists materially in cleaning off the boon, &c. In some cases the patentee inserts in the beaters fine steel pins or points, to assist in opening and cleaning the material. The current of air subsequently causes the dust, boon, tow, and lengths of the material that may have escaped from the main body thereof, to pass along a conduit to a room suitably covered to collect the boon, &c. In a portion of such conduit or room, spikes are arranged to arrest, collect, and keep free from the boon or dust the tow or escaping lengths of the material.

POLLAK, A. *Treating waste oily matters to obtain a product applicable to the manufacture of soap and other useful purposes in the arts.* Dated Jan. 14, 1856. (No. 99.)

In refining, rape seed and other oils are treated with sulphuric acid, which precipitates feculent oily matter that is at present thrown away. The object of the present operation is to free the refuse matter of acid, which is effected by washing it with hot water in a vessel suitably arranged, and so fitted that the contents may be agitated from time to time. Or it is subjected to the action of steam instead of hot water. It then stands, and the clear oil is drawn off.

DODGE, N. S. *Improvements in the preparation or manufacture of leather cloth.* Dated Jan. 14, 1856. (No. 101.)

This invention consists in preparing the cloth to be manufactured into leather cloth by communicating a uniform colour thereto, either by dyeing, or by tanning prior to the application of the enamelling material upon the surface.

CHAMBERS, A., and W. H. CHAMPION. *An improved mode of working railway breaks.* Dated Jan. 14, 1856. (No. 102.)

The patentees connect each pair of buffer-rods together by a bar, to the centre of which they joint a rod having an incline upon its inner end. This incline passes between a roller upon which it rests, and another roller attached to the upper end of two vertical links, with which it is free to move in a vertical direction when the incline is pushed inwards. The lower end of these links carry a pin which passes through vertical slots formed in the ends of two levers loose on a transverse shaft, and are maintained from falling below a horizontal position by chains attached to the framing. To this shaft are attached segments of ratchet-wheels actuated by clicks or palls carried by the levers, and these actuate sliding break blocks.

ULRICH, J. G. *Improvements in chronometers and other time-keepers.* Dated Jan. 14, 1856. (No. 103.)

This invention consists—1. In improvements in compensation curbs, &c. 2. In contrivances for rendering the vibrations of the balance spring isochronous. 3. In making the ordinary compensation balance useful for every change of temperature from zero to 130° of Fah., and destroying its tendency to being affected by terrestrial magnetism or local attraction. 4. In contrivances for suspending the chronometers in gymbals upon double universal joints attached to supports in the box. 5. In improved bolts or stays, for securing the chronometer when being carried. 6. In contrivances for preserving the detent from the concussion which takes place in coming to its banking screw. 7. In improvements upon the lever escapement, for reducing the amount of friction in unlocking and receiving of impulse, and in the guard for the prevention of tripping. 8. In improvements upon Remontoire escapements. 9. In improvements upon the compensation pendulum, and upon other kinds of compensation for clocks and regulators, instead of a compensation pendulum.

MALTESTE, A. E. *Improvements in shirts.* Dated Jan. 14, 1856. (No. 104.)

This invention consists—1. In a sort of half shirt or front, called a waistcoat shirt; and, 2. In an improved under shirt. The waistcoat shirt is a shirt without skirt or flaps, and resembles a waistcoat, being provided at the back with tape elastic bands, or any other arrangement for drawing together round the waist.

OWEN, W. *Improvements in stoves and fire-places.* Dated Jan. 14, 1856. (No. 106.)

A description of this invention will shortly be given.

NICOULLAND, P. T. A. *Improvements in steam-boiler furnaces.* (A communication.) Dated Jan. 14, 1856. (No. 107.)

This invention consists in constructing furnaces with a circular grate made to revolve round a fixed central grate.

HOSTAGE, J. and T. I. B., and J. TATLOCK. *Improvements in railway chairs.* Dated Jan. 15, 1856. (No. 108.)

This invention was described and illustrated at page 270 of our last volume. (No. 1702).

SHEPPARD, S. *A new or improved tap or stop-cock.* Dated Jan. 15, 1856. (No. 109.)

Claims.—1. A method of constructing taps or stop-cocks, by the use of a detached spherical valve of vulcanised caoutchouc or other

elastic material, the said elastic valve being forced against the pressure of the liquid upon its bed or seat, or liberated therefrom by means of a plunger raised and lowered by a screw. 2. A method of preventing leakage at the axis of taps or stop-cocks, by washers or packings tightened by means of a nut screwing on the axis of the tap or stock-cock.

BAKEWELL, T. H. *Improvements in ventilating, warming, and cooling rooms and other places.* Dated Jan. 15, 1856. (No. 110.)

Several new plans or principles originate under this and a former patent of the patentee. 1. The forcing power in combination with extraction applicable both to warming and cooling rooms, changing air, &c. 2. The mode of providing a small heated place, whether tube or otherwise, through which the air may be forced or drawn for the purpose of heating it. 3. The plan of forming a chilling tube or other cold space through which the air may be either drawn or forced, for cooling apartments in summer, and certain uses for the assistance of art and science. 4. A mode of combining other elements of air by introducing certain odours, gas, and various purifying powers, in order to separate or destroy the effect of impure or contaminated particles of air, too minute to be visible, but sufficiently powerful to be injurious.

DUNN, T. *Improvements in boilers and apparatus for heating water and generating steam.* Dated Jan. 16, 1856. (No. 111.)

This invention consists—1. Of improvements applicable to the boilers for which letters patent were granted to the patentee 13th October, 1853. 2. In the application of additional parts to boilers of the ordinary construction that require to be enlarged. 3. In constructing boilers and apparatus for heating water and generating steam, so that the various parts thereof may readily be replaced or substituted one for another when injured, or be easy of transport; also that they may possess a large amount of heating surface.—See *Mechanics' Magazine*, Vol. lxiv. p. 313, No. 1704.

M'EVOY, H. *Improvements in locks, latches, and staples.* Dated Jan. 16, 1856. (No. 112.)

This invention consists—1. In so constructing the bolt forming the latch part of the lock as to obtain great facility of action, &c. 2. In a method of combining the bolt forming the latch with "the follower," so that in turning the handle to the right or left the same force is required, a smooth action obtained, &c. 3. In strengthening the lock-frame by forming parts of the sides *of the frame*, so as to allow of using screws with counter sunk heads instead of the round-headed screws generally used. 4. In an improvement in the construction of box staples. Each staple is formed of one piece of wrought iron.

LAW, H. *Improvements in heaving up slips for the repair or construction of ships or other vessels, and for a continuous action purchase for the same, which is also applicable to other purposes.* Dated Jan. 16, 1856. (No. 113.)

Firstly, the patentee constructs the *cradle*, with a longitudinal depression to receive the keel and a portion of the vessel, so as to allow the bottom of the keel to be wholly or partly below the surface of the rails upon which the cradle runs. The second part of the invention consists of a continuous-action purchase for drawing the vessels up the slip, and which is applicable to other purposes. And thirdly, he adopts a mode of folding-up the chain upon a moveable carriage arranged for its reception, and upon which the links are deposited side by side in alternate directions as they are successively drawn up.

PRANGLEY, W. A. *A novel instrument for exercising the third finger, and thereby facilitating the playing upon musical instruments.* Dated Jan. 16, 1856. (No. 114.)

The patentee constructs for each hand a forked shield or frame, upon which is mounted a spring lever, and to this lever is attached a loop to receive the third finger. The spring will raise the third finger while the second and fourth are kept down by the shield, and the player, by alternately drawing down the third finger and letting it rise with the spring lever, will be able to keep the muscles in motion while pursuing any indifferent occupation.

SCULLY, V., and B. J. HEYWOOD. *Improvements in the construction of inkstands, applicable in part to other vessels for the reception of fluids.* Dated Jan. 16, 1856. (No. 115.)

This invention relates firstly to the application to inkstands of certain means for filling the dipping cup with ink and withdrawing the ink therefrom when not required. Secondly, to the application of valves acting on the self-closing principle to certain other uses.

ABRAHAM, J. *New or improved machinery for the manufacture of percussion-caps, and for cutting out and raising articles in metal generally.* Dated Jan. 16, 1856. (No. 116.)

Claims—1. A general arrangement of the invention as described and represented in the drawings, for the manufacture of percussion caps, and for cutting out and raising articles in metal generally. 2. Feeding blanks to the raising tools of machines for raising articles in metal by means of a rotating disc or plate.

HAMILTON, J., junior. *Improvements in the posts or uprights employed in constructing electric telegraphs.* Dated Jan. 16, 1856. (No. 117.)

Each post or upright is constructed as follows:—A cast-iron plate or foot is formed with an upright tubular socket; such socket is at its lower parts made with openings, so that the earth may fall through and fill in the interior. The upper part of the post is made of a tube of wrought-iron, by preference coated with zinc, and its lower end enters the socket, and is fixed thereto by rivets or otherwise. The socket rises to some inches above the earth. The top of the post is covered in with a cap to throw off the rain from the post, and transverse bars of wood are fixed to the upper part of the post to receive the wires.

THOMPSON, J. *Improvements in ships' keelsons.* Dated Jan. 16, 1856. (No. 118.)

This invention was described and illustrated at page 225 of our last number.

HAMILTON, J., junior. *Improvements in constructing the permanent ways of railways.* Dated Jan. 16, 1856. (No. 119.)

In this invention corrugated iron is used for longitudinal bearings, bent into an arched form, with the corrugations transverse of the railway. The parts are connected by rivets or otherwise, so as to form a continuous bearing, and the gauge is maintained by ties of iron. The corrugated iron, it is preferred, should be coated with zinc. On the upper parts of these bearers trough or bridge-rails are fixed. In some cases a longitudinal plate of iron is fixed to the upper surface of the bearers, and the rails are fixed to such plate; or similar bearers may be used transversely of a railway.

FOWLER, J., junior. *Improvements in machinery for ploughing land.* Dated Jan. 16, 1856. (No. 120.)

When working with a subsoil plough, the patentee combines an upright or horizontal barrel or capstan on the same frame, platform, or base-plate, with an engine which gives motion to it, by which capstan the plough is moved by a wire rope, and there is a second barrel for moving, by another wire rope, the engine and capstan from point to point along the head-land. The machinery is arranged to make a direct pull on the plough, and is therefore moved a distance each time equal to that between drain and drain. Another improvement relates to the anchor. A plate or frame is used, which is placed upright in a hole. On this is hinged a lever, to the upper end of which a chain or rope is fixed; the lower end of this lever is formed with a broad end or plate, which, when the lever is pulled on, rests against the opposite side of the hole, and very securely anchors the engine, &c.

DRING, D. *Improvements in machinery for cutting wood pegs.* (A communication.) Dated Jan. 16, 1856. (No. 121.)

In cutting wood pegs (suitable for making boots and shoes) three machines are used. The first cuts a slice from the end of the log of thickness equal to the length of the pegs to be made, and also planes the face of each slice; the second machine scores one side of the slice with a series of V-formed grooves parallel to each other, and having spaces between them equal to the thickness of the pegs; when the slice is scored in one direction it is turned one quarter round, and scored with similar grooves at right angles to the first; thus, a series of points are formed on the surface of the slice of wood, each of which points becomes the point of a finished peg when the slice is split up, which is done in the third machine.

FONTAINEMOREAU, P. A. L. DE. *An improved apparatus for the prevention of accidents or collisions on railways.* (A communication.) Dated Jan. 17, 1856. (No. 123.)

This invention consists in the employment of an eccentric or other mechanism producing similar effects, fixed to one of the axles, which, in connection with a paul and ratchet wheel, is made to put in action the breaks to any number of carriages.

RECHTEN, P. *The taking of whales and other cetaceous fish by means of a harpoon constructed on entire new principles.* Dated Jan. 17, 1856. (No. 125.)

The barb of the harpoon is made in one piece, arranged so as to turn on a centre at the end of the shaft. It is, when necessary for use, retained by a wooden peg, so that one of the ends of the barb is in front, and first enters the fish, but as soon as the strain comes on the line, the wooden peg breaks, and the barbs place themselves at right angles to the shaft of the harpoon. The invention also consists in the manner of attaching and arranging the line of the harpoon.

CHAPMAN, W. *An improvement in propelling vessels.* Dated Jan. 17, 1856. (No. 129.)

The inventor furnishes the vessel with two cylinders, one a steam cylinder, and the other open at its after end to the water, and in each of these cylinders is a piston, the two being connected by a rod. The action will be readily understood.

COMSTOCK, J. J. *Improvements in generating steam.* (A communication.) Dated Jan. 17, 1856. (No. 130.)

This invention consists in generating steam by means of bringing water in small quantities and divided into minute particles into contact with metal heated by steam, and in suitable apparatus for carrying this arrangement into effect.

PLATT, J., and J. WHITAKER. *Improve-*

ments in machinery or apparatus for doubling or twining yarns or threads, parts of which improvements are also applicable to mules for spinning. Dated Jan. 17, 1856. (No. 131.)

This invention relates, firstly, to machinery for doubling or twining yarns or threads constructed upon the principles of the mule or jenny, and consists—1. In applying thereto three or more list boards (in place of the one as usual) over which the yarn passes, and in contact with which it is kept by a rod or rods supplied with hooks or guides for the threads to pass through. 2. In reference to the holding of the material during the winding on, the patentees apply the apparatus for effecting that object behind the list boards, or between the first and second or second and third, instead of before that where the grooves, clamps, jaws, or slides are usually placed. They also effect the holding in a peculiar manner, the essential feature of which consists in causing it to be detained by friction around an extended surface, in contradistinction to the nipping action in common use. Another part of the invention refers to the underfaller, and consists—1. In forming it hollow. 2. In applying a covering of flannel or other substance. 3. In causing the said faller to turn a portion of a revolution at intervals, in order to bring fresh portions of its surface in contact with the material. 4. In applying heat thereto. These improvements relating to the faller are applied to mules for spinning, with the exception of the last.

Squires, W. W. *Improvements in preventing the bursting of pipes and tubes for conveying liquids.* Dated Jan. 17, 1856. (No. 132.)

Claims.—1. The adaptation of a described small air tap and of the air valve below the stop-cock; also, a mode specified of drawing off or "letting on" water or other liquids, by means of valves or flaps actuated by levers and wires or communicators. 2. A grooved or tubular opening to the stop-cock forming an improved stop-cock. 3. A perforated plug or valve, with suspending wire working within a tube. 4. A perforated plug or valve with the tube attached. 5. The attachment of air tubes, as specified, for admitting air to tubes or pipes for conveying liquids.

Tremeschini, G. A. *Improvements in electro-telegraphic communications.* Dated Jan. 18, 1856. (No. 133.)

This invention relates to receiving and manipulating instruments—a new key or secret alphabet for dispatches to be transmitted—and a new arrangement of the electro-telegraphic circuit and apparatus to be annexed thereto. The improved receiving apparatus *unites the advantages* of Morse's writing, and Wheatstone's and Breguet's dial telegraphs.

Bergue, M. De. *Improvements in the permanent way of railways.* Dated Jan. 18, 1856. (No. 135.)

This invention consists in so forming the rails with a rib or feather disposed vertically or nearly so, and the support, foundation, or bearing for the rail with a rib or feather also disposed vertically or nearly so, that the rib or feather of the rail may be placed by the side of and against that of the support, foundation, or bearing, and the two be bolted or otherwise connected together.

Schloss, J. *A piston-bolt, or certain improvements in fastening travelling-bags, portmonnaies, cigar-cases, writing-desks, drawers, doors, and similar objects where locks, bolts, or clasps are employed.* Dated Jan. 18, 1856. (No. 136.)

This invention may be used either for mere fastening or bolting purposes, or combined with a lock. In the first instance the fastening apparatus is formed by a small cylinder or tube. This contains on one end a piston, which works in it at about half-way of the length of the cylinder, against a spiral spring fixed on the other end to a knob similar to that of the piston. The piston has a small pin secured to its lower part, which pin runs in a small opening in the female part of the clasp. Opposite to this pin there is fixed on the male part a hook of the ordinary shape, which, by a slight pressure, is forced to catch that pin, whereby the closing is effected. The opening is effected by a slight pressure on the knob of the piston.

Dodge, N. S. *Improvements in treating vulcanized India-rubber or gutta percha.* (A communication.) Dated Jan. 18, 1856. (No. 141.)

This invention relates to a mode of treating vulcanized India-rubber, &c., for rendering scraps or waste pieces, such as old shoes, &c., fit to be re-used without requiring to be vulcanized. The material is reduced into small pieces, and placed in a vessel capable of being hermetically closed, and to it is added pure alcohol and bisulphuret of carbon (½ lb. of the former and 10 lbs. of the latter to 100 lbs. of the material), the alcohol and the bisulphuret being previously mixed together, and then poured over the material to be treated. The vessel is then closed air-tight for two hours, at the end of which the process is complete.

Manceaux, F. J. *Improvements in fire-arms.* Dated Jan. 18, 1856. (No. 142.)

This invention consists in an improved bolt and appendage for working the bolt and closing the chamber in breech-loading fire-arms, and also in an improved sight for fire-arms.

DAWSON, A. *An apparatus for converting small coals, or coal dust, or small coals and coke, or coal dust and coke, with the admixture of water or other materials, into solid blocks of fuel, parts of which apparatus can be used and are suited for other purposes.* Dated Jan. 19, 1856. (No. 148.)

Claim. — The making of an apparatus whereby small coals or coal dust, or coal dust and coke, admixed with a portion of water or other materials, are heated in an oven of a uniform heat, or nearly so, in a thin form, within a box made nearly air-tight, and so made that the materials can be withdrawn from the thin form, and transformed into a thick or cubic form into a box, without exposure to the atmosphere, and compressed into compact blocks of fuel.

PICKERING, E. *Improvements in the permanent way of railways.* Dated Jan. 19, 1856. (No. 149.)

The patentee constructs a hollow compound rail and longitudinal bearer or sleeper of triangular form, and having a rail head or surface for travelling upon at each of the three angles or edges. This rail and bearer is bedded in the ballast with one of its angles uppermost, on which the wheels travel. When one rail is worn out one of the others is placed uppermost, and when this is worn out the third is used.

BARNES, I. *Improvements in carriage lamps.* Jan. 19, 1856. (No. 151.)

This invention consists—1. In making the glasses for carriage lamps in one piece, similar to an ordinary lamp globe, and of any form that may be wished, avoiding the use of any metal frame or mounting, except at the top and bottom. 2. In the arrangement of certain internal reflectors, so as to throw the light in any particular direction. 3. In an improved mode of attaching the lamp iron to the carriage, so that the whole lamp and iron may if desired be removed from the carriage and refixed with ease.

ROBERTSON, C. *Improvements in mariners' compasses.* Dated Jan. 19, 1856. (No. 155.)

The object of this invention is to enable the navigator to detect at any time the amount of variation and deviation of the compass in iron and other ships. On the glass which covers the compass card an index or pointer is mounted, which turns on a centre in the middle of the glass. On this index a style is mounted, from which a shadow is thrown by the sun, and the index is set to the direction of the shadow, which, if the time be noon, will be due north and south, and at any other time the due north and south is readily calculated from the direction of the shadow. There is also a sight placed at the end of the index by which the direction of the sun is directly observed, and the index set accordingly when the sun is near the horizon.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

JOHNSON, J. H. *Improvements in cards for jacquard mechanism.* (A communication.) Dated Jan. 11, 1856. (No. 82.)

This invention relates to certain perforated cards for Jacquard machines, whereby one set of cards is made permanently applicable to any variety of designs or patterns, by simply adjusting or setting the cards accordingly.

JOHNSON, J. H. *Improvements in railway breaks.* (A communication.) Dated Jan. 11, 1856. (No. 83.)

In this invention the carriages or waggons are entirely lifted off the rails, and rest with the whole of their weight upon suitable shoes or skids, which are brought instantaneously into contact with the rails at every carriage throughout the entire length of the train, if desired, when the breaks are put on.

ROUTLEDGE, W. *Improvements in cocks or valves for regulating the flow and pressure of steam, water, or other fluids.* Dated Jan. 11, 1856. (No. 88.)

This invention consists of a peculiar valve connected with a lever, which communicates its action to the valve by means of two pinion wheels, one on the axis of each. The lever has a sliding weight on one end, between which and its axis is bolted a piston rod, its piston regulated by a spiral spring enclosed in a barrel closed at bottom in which both work. The opposite end of the lever is bolted to a piston rod, its lower connected with a piston, and its upper end elongated for receiving perforated or other weights. By this arrangement is obtained an equilibrium valve, the object of which is to reduce high pressure steam to any low pressure required.

DAY, R. K. *Improvements in the manufacture of fuel.* Dated Jan. 12, 1856. (No. 94.)

In the manufacture of fuel for lighting fires a mould is used, into which the bars or pieces of wood are placed at a distance apart from each other, and are then combined by introducing into the mould artificial fuel in a plastic state.

FREELAND, A. B. *Improvements in the preparation of flour for the purposes of its better preservation and carriage, and in the machinery or apparatus employed therein.* Dated Jan. 12, 1856. (No. 95.)

This invention consists in compressing flour into compact masses by hydrostatic or other powerful presses.

POLLAK, A. *A new fusee or cigar-light.* Dated Jan. 14, 1856. (No. 98.)

In this invention strips of paper are steeped in a solution of nitre or other suitable salt that will cause the paper to burn slowly and without flame. They are then dipped in a perfumed solution, by which they give off an agreeable odour when ignited, and then made into rolls, and finally tipped with phosphorus.

BENTALL, E. H. *An improvement in the construction of machinery for cutting and pulping turnips and other vegetable matters.* Dated Jan. 14, 1856. (No. 100.)

The object of this invention is to prevent the turnips, while under operation, from turning round and slipping back from the knives or grating surfaces when they first come into contact therewith. For this purpose, instead of making the front plate flat, as heretofore, the inventor gives it a curved form, proportioning it to the diameter of the cutting barrel.

BRADE, A. G. *Improvements in recovering the wool from fabrics in which the same exists, together with silk or vegetable textile fibres.* Dated Jan. 14, 1856. (No. 105.)

This process consists in submitting the fabrics first to an agent having the property of preserving the animal textile fibres from the injurious action of the agent to be employed afterwards for disintegrating the silk or vegetable fibres, or in at once submitting the fabrics to the combined actions of a preserving agent of the animal and of a disintegrating agent of the silk or vegetable fibres; for instance, the fabrics may be submitted first to a bath of sulphate of zinc dissolved in water, and afterwards to a bath of diluted sulphuric acid, or they may be submitted at once to a bath of sulphate of zinc dissolved in water, and diluted sulphuric acid.

TOLHAUSEN, A. *An improved gas-meter.* (A communication.) Dated Jan. 17, 1856. (No. 124.)

The principle on which this invention is based, is that the liquid in the gas meter is made to resist evaporation and freezing by means of certain impregnations.

CARRINGTON, S. R. *Certain improvements in the manufacture of hats, and in machinery or apparatus connected therewith.* Dated Jan. 17, 1856. (No. 126.)

This invention consists—1. In manufacturing the bodies of hats of layers of calico, &c., cemented together by passing the fabrics through the ordinary waterproofing or stiffening solution of shellac varnish, &c., and afterwards submitting it to the operation of calendering. 2. In the use of calendering rollers or machinery for the above-named purposes, in place of the ordinary method of ironing hat bodies by hand. 3. In the use of dies, stamps, or cutters, for the cutting *out, stamping, forming,* or shaping the brims of hats, instead of cutting them out by hand.

JACKSON, J. *An improved apparatus for retaining and releasing cords of "Venetian blinds," or cords, bands, or chains employed for other purposes.* Dated Jan. 17, 1856. (No. 127.)

In this invention a box containing certain apparatus is fitted on to the top bar of the Venetian blind. The cords being passed under a certain swinging wedge, and along the bottom of the box, and one of the cords being placed through a hole in the end of a cranked lever (the other cord passing down the side of the blind), if the cords are now drawn downwards so as to lift the blind, the wedge follows the direction of the cord so far as the axis or pivot will allow, and permits the blind to be drawn up, but immediately upon the release of the cord the wedge drops upon it, and holds it between the thin end of the wedge and the bottom of the box.

PHILCOX, O. *Increasing the effect and the facility in fingering the pianoforte, organ, or other musical instruments having a keyboard.* Dated Jan. 17, 1856. (No. 128.)

This invention mainly consists of an arrangement of the white keys in two rows, the first being level, the second with a surface inclined towards the front, thus forming a valley in which the sharps and flats are placed in a certain way, having the form of stops or buttons inserted in the keys to which they belong.

MOSELEY, J. *The transport of all goods, merchandize, and valuable commodities whatsoever.* Dated Jan. 18, 1856. (No. 134.)

The inventor employs a machine (or more than one) of a spherical, cylindrical, or barel form, and furnished with pivots to which the horse, or engine, or other propeller is attached. The machine itself rolls upon the ground, and has the articles to be transported within it.

MARSHALL, W. *An improvement or improvements in rolling iron for the manufacture of gun-barrels and tubes, and for other like purposes.* Dated Jan. 18, 1856. (No. 137.)

In the manufacture of wrought iron into bars, the inventor rolls the same into the form of a square prism (or approximately so). By passing the said bar between rolls suitably grooved, he forms a gutter on one side along its whole length. By successive rollings the same gutter is deepened, and the lower external angles rounded. The bar thus assumes in cross section the form of the letter V. By subsequent rolling the upper ends of the parallel sides are turned towards each other, and a tube-like form is produced, the edges being in contact, or nearly in contact. The whole operation may be performed with one pair of fluted rollers.

RULE, H. G. *Certain improvements in machinery or apparatus for measuring water or other fluids.* Dated Jan. 18, 1856. (No. 138.)

The improved water-meter consists of a cylinder, in which is placed a wheel having four or more arms, vanes, or divisions forming compartments. The water enters the cylinder by an inlet pipe, flowing into one of the compartments, impinging upon the arm or vane, and forcing the wheel round. The water is discharged at an outlet pipe opposite the inlet pipe. The axis of the internal wheel passing through the cylinder, has a counting and indicating apparatus placed on either of its outer ends.

SHAW, D. *Certain improvements in looms for weaving.* Dated Jan. 18, 1856. (No. 139.)

These improvements apply to a motion for stopping the loom when any of the warp threads break, or when a "float" occurs, or any other obstruction takes place, and consist—1. In inserting light flexible tubes between the healds and the ordinary shafts, laths, or rods over which they are passed. 2. In a new method of dividing the healds in certain descriptions of weaving, such as ginghams, so as to cause the eyes to be arranged in the two distinct rows or lines, one higher than the other.

MYERS, E. *Improvements in buffers and other springs for railway and other carriages.* Dated Jan. 18, 1856. (No. 140.)

This invention relates to a peculiar arrangement of annular, vulcanized caoutchouc springs, for obtaining an elastic buffing action, &c. The improvement consists in fitting two or more series of such springs in a suitable spring box or casing, each set being placed in a separate compartment of its own, such compartments being concentrically arranged, so that the inner set of springs will be of smaller diameter than the outer one.

HOLDEN, J. *Improvements in machinery for cutting or carving and figuring wood.* Dated Jan. 18, 1856. (No. 143.)

This invention consists in producing wood letters and other devices in wood, by means of cutters caused to revolve and guided by tracers connected to the ends of a lever or levers. The tracers revolve over a model of the figure to be cut, placed upon a table caused to revolve under the tracers, or upon a moveable bed, and the cutters act upon the wood to be figured, which is placed upon a corresponding table or bed under the cutters, and caused to partake of a similar motion to that imparted to the model bed.

HARRISON, C. W. *Improvements in transmitting communications, and in the apparatus employed therein.* Dated Jan. 18, 1856. (No. 144.)

This invention consists in facilitating the passage of sound through speaking tubes or pipes by the admission therein of a current of air, vapour, or gas produced or impelled by any suitable arrangement or mechanical contrivance. In regulating or cutting off the passage of sound or currents of air in speaking tubes or pipes by means of taps or other suitable mechanical means. In the employment of cylinders of any suitable form in connection with speaking tubes or pipes for receiving or collecting sound. In constructing speaking tubes or pipes with flexible apertures or mouths. And in varnishing or glazing the interior of speaking tubes or pipes to render them smooth.

MARZOLO, J. *"A reproductive organ," printing with known notes any musical fancies, and equally applicable to pianofortes, melodiums, harmoniums, accordions, and generally to all keyed musical instruments.* Dated Jan. 18, 1856. (No. 145.)

This apparatus may be applied to any musical instrument having keys. The music is printed on the paper by the simple touch or action of the keys, with types producing characters like those used in ordinary printing or copying. With the identical repetition or reprint (as often as may be desired) of the airs effected by mechanical reaction on the key-board of the instrument, the composer may possess the exact impression of a new musical idea reproduced as often as required.

PROVISIONAL PROTECTIONS.

Dated August 15, 1856.

1907. John Burns Smith, of Manchester, mill manager. Certain improvements in machinery for preparing, spinning, and twisting cotton and other fibrous substances.

1909. Henry Alfred Jowett, of Sawley, Derby, engineer. Improvements in rails and railway chairs, and in the construction of railways.

1911. Charles Richard Skinner, of St. John's, Worcester, tanner and currier. Certain improvements in tanning and finishing off leather.

Dated August 16, 1856.

1913. William Tranter, of Birmingham, Warwick, gun maker. Improvements in fire-arms.

1915. George Slater, of Burnley, Lancaster, manufacturer, John Williams, of the same place, overlooker, and Septimus Whitaker, of the same place, mechanic. Certain improvements in power looms for weaving.

1917. John Weir Draper Brown, of Burrels Hotel, London-bridge, and George Gibson Brown, of Deptford Dockyard. Improvements in signal lanterns.

1919. Samuel Lilley, of Birmingham, Warwick, engineer. Improvements in the manufacture of ships' iron work, a part of which improvements is applicable to the manufacture of other articles in iron.

1921. Louis Auguste Joyeux, of Marseilles, France. Improvements in obtaining motive power.

Dated August 18, 1856.

1923. Thomas Scott, of Barnhill Workhouse, Glasgow, Lanark, North Britain, meehanic. Improvements in cooking.

1925. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improved machinery for cutting and finishing metal screws. A communication.

1927. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improved machinery for forging or working iron and other metals. A communication.

1929. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in stopping or retarding railway carriages and trains, and in preventing carriages running off the rails. A communication.

1931. Charles Marie Chouillon, manufacturer, of Paris, France. Certain improvements in thinning or shaving tawed, tanned, or dressed skins.

Dated August 19, 1856.

1933. Henry Forfar Osman, of Essex-street, Strand, London, Middlesex, gentleman. An improved electric clock. A communication.

1935. Edwin Sutton, of Regent-street, Middlesex, optician and photographic artist. An improved construction of stereoscope.

1937. Robert Jobson, of Wordsley, Stafford, iron founder. Improvements in apparatus for pouring iron or other metal into moulds.

1939. Joseph Brouard and Joseph Hubert, of Rue de l'Echiquier, Paris, France. Certain improvements in reefing the sails of ships or vessels.

1941. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. An improvement in valves for steam engines. A communication.

Dated August 20, 1856.

1943. John Henry Johnson, of Lincoln's-Inn-fields, Middlesex, gentleman. Improvements in steam engines. A communication from N. Duvoir, of Liancourt, France.

1945. Thomas Sagar, of Burnley, Lancaster, machine maker, and Christopher Turner, of the same place, machine maker. Certain improvements in power looms for weaving.

1947. William Gossage, of Widnes, Lancaster, chemist. Improvements in obtaining sulphur and metals from certain ores and other compounds of metals.

1949. William Stones, of Greenhithe, Kent, paper manufacturer. Improved machinery for damping sheets of paper intended to be printed upon, so as to render the usual operation of wetting unnecessary.

Dated August 21, 1856.

1952. Joseph Crossley, carpet manufacturer, of Halifax, York, and James Bolton, of the same place, overlooker. Improvements in apparatus or means employed in the printing of yarns for carpets and other fabrics.

1956. Robert Kenton, of Birmingham, Warwick, manufacturer. A new or improved manufacture of fishing reels.

1958. George James Farmer, of Birmingham, Warwick, machinist. Improvements in machinery to be used in the manufacture of chain links, buckles, buckle slides, rings, and other similar articles.

Dated August 22, 1856.

1960. William Patten, of Old Fish-street, Doctors' Commons. An improvement in apparatus for supplying water to the basins of water closets and other vessels.

1962. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improved machinery for cutting chenille. A communication from Messieurs Cadinot and Chennevière, of Elbeuf, France.

Dated August 23, 1856.

1964. Frederick Albert Gatty, of Accrington, Lancaster, manufacturing chemist. Certain improvements in dyeing.

1966. Edward Hallen, of Cornwall-road, Lambeth, Surrey, civil engineer. Improved means for washing wool.

1968. John Henry Johnson, of Lincoln's-Inn-fields, Middlesex, gentleman. Improvements in casting metals. A communication from Messrs. Jackson Brothers, Petin, Gaudet and Company, of Rivé de Gier, France.

1970. Etienne Sterlingue, manufacturer, of Paris, French Empire. Improvements in preparing for tanning, and in tanning hides and skins.

1972. George James Farmer, of Birmingham, Warwick, machinist. Improvements in hardening iron and steel.

1974. Samuel Stocks, of Collins-green, near Warrington, Lancaster. Improvements in reaping machines.

Dated August 25, 1856.

1976. Marc Antoine François Mennons, of Rue Napoléon Montmartre (Dept. de la Seine), France. A new composition applicable to the coating or covering of metallic and non-metallic surfaces. A communication.

1978. Pierre Philippe Celestin Barrat and Jean Baptiste Barrat, of Paris, French Empire, doctors. Improvements in steam digging apparatus suitable for draining and excavating purposes, parts of which are applicable to reaping.

1980. William Frederick Plummer, of St. Mary's Overy Wharf, Southwark, mechanist. Improved apparatus applicable to the grinding of grain and other substances.

Dated August 26, 1856.

1984. William Henry Perkin, of King David Fort, Saint George-in-the-East, Middlesex, chemist. Producing a new colouring matter for dyeing with a lilac or purple colour stuffs of silk, cotton, wool, or other materials.

1986. Joshua Horton, of Birmingham, Warwick, manufacturer, and Thomas Horton, of Birmingham, manufacturer. An improvement or improvements in the manufacture of paper, pasteboard, and pulp.

1988. Edward Alfred Cowper, of Great George-street, Westminster, civil engineer. An improvement in the manufacture of candles.

1990. Edmund Simpson, of Preston, Lancaster, manufacturer of gold thread. An improved safety cage for mines and pits, or apparatus to be fitted to cages to prevent accidents from the falling thereof.

Dated August 27, 1856.

1994. Louis Horrie, of Keighley, York, and James Schofield, of Rochdale, Lancaster, grease manufacturers. Improvements in the mode or method of extracting oil and grease separately from suds used in washing flannel and other woollen goods, for distilling the said grease or other fatty matters, and in the apparatus employed therein.

1996. John Moore, of Aston, near Birmingham, Warwick, manufacturer, and William Moore, of Aston, near Birmingham, manufacturer. A new or improved tap or stop cock.

1998. Samuel Roberts, of Hull. Improvements in regulating the supply of steam to engines working screw or submerged propellers, and in regulating or relieving the pressure of steam on slide valves.

2000. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improved machinery for combing fibrous substances. A communication.

2002. William Green, George Holloway, and Thomas Grubb, rug manufacturers, all of Kidderminster, Worcester. Improvements in the manufacture of rugs.

PATENTS FILED WITH COMPLETE SPECIFICATIONS.

2011. Edward Poitiers, of Malden-terrace, Haverstock hill, Middlesex. The application of a new material or materials for the manufacture of brooms and brushes in general and for other purposes, and for improvements in the manufacture of street scavengers' and other brooms and brushes. August 29, 1856.

2033. Lazarus Simon Magnus, of Adelaide-chambers, London. Improvements in the manufacture of coke. A communication. September 1, 1856.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," September 9th, 1856.*)

1022. F. G. Spilsbury. Separating metals, metallic oxides, and metallic acids from their ores.

1024. J. Rigby. Improvements in machinery or grinding or sharpening the card cylinders and rollers of carding-engines.

1036. N. Smith. Improvements in clod-crushing rollers, parts of which are applicable to other descriptions of rollers.

1044. A. Gordon. Improvements in evaporating, boiling, and distilling fluids, and generating steam.

1050. P. A. L. de Fontainemoreau. Improvements in electric telegraphs. A communication.

1054. W. Garside. A new and improved method of letting off the worsted or yarn from the bobbins employed in weaving carpets and other similar fabrics in which bobbins are employed during the manufacture thereof.

1055. C. Bloomer. Improvements in the manufacture of spikes and bolts.

1058. I. Holden. Improvements in preparing and combing wool and other fibrous substances.

1071. W. J. Curtis. Improvements in carriages to run on rail or tram ways and common roads.

1074. J. Périnaud. Certain improvements in preparing or dressing silk.

1117. E. Besnier de la Pontonerie. Certain improvements in the apparatus for consuming smoke. A communication.

1139. G. P. Harding. An improvement in the manufacture of cloth bonnets.

1187. W. Maugham. An improvement in rendering wood fireproof.

1262. T. Charlton and W. Turnbull. Improvements in steam engines.

1284. J. H. Heal. An improvement in hair and wool mattresses.

1358. W. E. Wiley. Improvements in the manufacture of metallic pens and penholders.

1363. C. W. Siemens. Improvements in engines wherein superheated steam is used.

1616. W. B. Adams. Improvements in railway wheels, axles, and axle-boxes.

1647. W. B. Adams. Improvements in the permanent way of railways.

1873. D. Fehrman. Improvements in lamps adapted for burning resin oil. A communication.

1901. J. Knowles and W. Clarke. Certain improvements in looms for weaving.

1903. W. Morgan. Improvements in the manufacture of guns and mortars.

1913. W. Tranter. Improvements in fire-arms.

1929 R. A. Brooman. Improvements in stopping or retarding railway carriages and trains, and in preventing carriages running off the rails. A communication.

1930. A. P. How. Improvements in pumps.

1931. C. M. Chouillou. Certain improvements in thinning or shaving tawed, tanned, or dressed skins.

1946. C. Clark. Improvements in combining and arranging looking-glasses for toilet purposes.

1970. E. Sterlingue. Improvements in preparing for tanning, and in tanning hides and skins.

1990. E. Simpson. An improved safety-cage for mines and pits, or apparatus to be fitted to cages, to prevent accidents from the falling thereof.

2011. E. Poitiers. The application of a new material or materials for the manufacture of brooms and brushes in general and for other purposes, and for improvements in the manufacture of street scavengers' and other brooms and brushes.

2033. L. S. Magnus. Improvements in the manufacture of coke. A communication.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1853.

2042. John Clare, jun.
2046. William Edward Newton.
2052. James Davis and Robert Ramsey.
2058. David Law and John Inglis.
2065. Robert Harrington.
2076. Michael Leopold Parnell.
2092. John Grist.
2097. Robert Tronson.
2119. James Hill Dickson.
2171. Charles Collins.
2326. William Beardmore and William Rigby.

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Sealed September 5, 1856.

1856.

565. Robert Morrison.
574. Thomas Cook.
575. Henery B. Young.
576. Henry Cooke.
587. Alexandre Tolhausen.
590. Oliver Maggs.
603. John Northcote Ryder.
610. Isaac Dixon.
635. Charles Benjamin Normand.
653. Augustus Dacre Lacy.
681. John Hinks and George Wells.
697. William Pitt and Edwin Turner Davies.
717. Alexandre Tolhausen.
718. Alexandre Tolhausen.
725. James Rock, jun.
730. Alexandre Tolhausen.
741. Joseph Auguste Barratte.
762. Charles Benjamin Normand.
767. Charles Durand Gardissal.
996. William Gossage.
1013. John Hick.
1027. William Edward Newton.

1239. Thomas Herbert and Edward Whitaker.
1343. William Watson Hewitson and William Hamond Bartholomew.
1419. William Henry Barlow and William Henry Woodhouse.
1583. Lorenzo Blackstone.
1587. Alfred Louis Stanislas Chenot and Eugène Charles Adrien Chenot.
1588. Alfred Louis Stanislas Chenot and Eugène Charles Adrien Chenot.
1589. Alfred Louis Stanislas Chenot and Eugène Charles Adrien Chenot.
1590. Alfred Louis Stanislas Chenot and Eugène Charles Adrien Chenot.
1595. William Laing.

Sealed September 9, 1856.

581. Pierre Denis Nelot.
586. Joseph Davy and John Milnes.
608. Joseph Sturge and Alfred Sturge.
609. George Rees.
652. Thomas Richardson and George William Jaffreys.
692. James Robertson.
750. Alfred Trueman.
788. William Roberts.
1040. Richard Pearcy.
1188. George Wilkinson.
1439. Charles Edmond Green.
1490. Henrich Ludwig Buff and Frederic Versmann.
1504. David White.
1568. Hilton Greaves.
1618. Rudolph Bodmer.
1688. Francis Barber Howell.

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LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

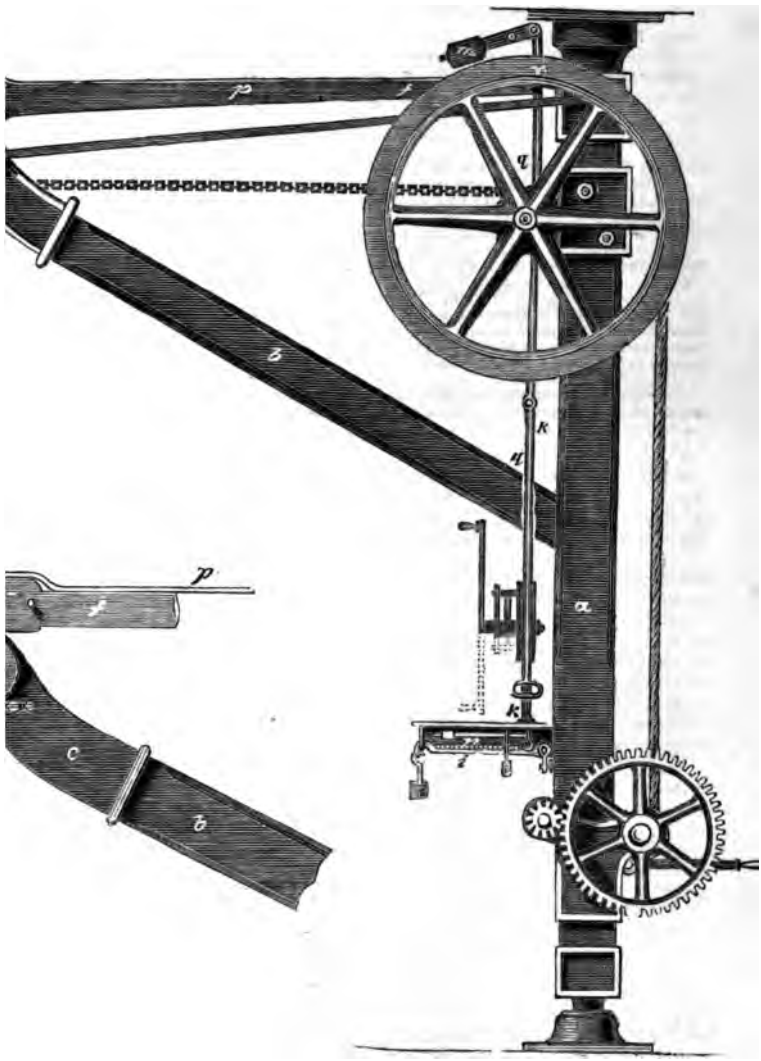
Mechanics' Magazine.

.] SATURDAY, SEPTEMBER 20, 1856. [PRICE 3D.

Edited by R. A. Brooman, 166, Fleet-street.

FLETCHER'S WEIGHING CRANES.

Fig. 1.



FLETCHER'S WEIGHING CRANES.

MESSRS. J. AND W. FLETCHER, of Salford, have recently patented an improvement in weighing cranes, and other similar elevating machines, which consist in the application of the ordinary weighing beam to the "jib" or head of the crane, or other lifting apparatus, the shorter or fulcrum end of the beam carrying the pulley, over which the chain or band passes to the weight to be raised or lowered. The chain passes from the winding drum under a guide pulley, suitably situated as to cause the chain to rise perpendicularly on to the chain pulley upon the weighing beam; it then passes over the chain pulley, and perpendicularly down to the weight. By this arrangement the weight of bodies may be ascertained during the operations of raising or lowering them.

Fig. 1 is a side elevation of an ordinary lifting crane, to which the improvements (for weighing and lifting simultaneously, if required) are shown attached; and fig. 2 is a detached view of the "jib head," having one of the sides or bearings removed, the more clearly to show the position of the pulleys and the lever for locking the chain or rope upon the same; this view also exhibits the two centres or bearing points of the weighing beam upon the "jib head," the one becoming the fulcrum of such beam when the crane is required to weigh, and the other merely bearing the weight of the weigh-beam, and its pulley, when the crane is required to be employed alone.

In fig. 1, *a* is the main upright of the crane; *b*, the "jib;" and *c*, the "jib head," which is furnished with two bearings, one for the reception of the fulcrum, *d*, and the other for the projecting stud, *e*, both of which are fixed upon the weigh-beam, *f*; at the same end of the weigh-beam, *f*, is situated the pulley, *g*, upon which the whole weight of the goods bears; below the pulley, *g*, is placed a guide pulley, *h*, in such a position as to allow the chain or rope to pass from it on to the pulley, *h*, in a direct perpendicular line, so as to insure the whole weight of the goods to be weighed being upon the end of the weigh-beam. At a convenient place near the winding apparatus is fixed a small graduated steel-yard, *i*, in connection with the narrow end of the weigh-beam, *f*; by this connection the weight of goods is transferred down from the beam, *f*, to the steel-yard, thus rendering the operation of adjusting the balance and weighing more convenient. Upon the rod, *k*, connecting the beam and steel-yard, is placed a sliding apparatus, worked by the handle in connection with the excentric, *l*, which, by drawing down the narrow end of the beam, *f*, will raise the stud, *e*, and throw the weight upon the fulcrum, *d*, bringing the beam, *f*, and sliding apparatus into the position shown by the dotted line; thus the weight of the goods, being balanced upon the beam, *f*, is transferred to a more convenient position for adjustment upon the steel-yard, *i*. Upon the rod, *k*, which is attached to the beam, *f*, is a counterbalance weight, *m*, used to counterbalance the weight of the rod, *k*, and apparatus thereupon, and the different weights of grapnel irons, &c., for holding the goods upon the chain; the lever, *n*, above the steel-yard, *i*, is also for the better adjustment of these incumbent weights. When the goods to be weighed are attached to the chain, it will be requisite, in order to ascertain the true weight of such goods, that they should be suspended steadily (that is, neither be raised or lowered during the process of weighing); to effect this object, the chain passes through the wedge-shaped cavity or recess, *o*, shown in fig. 2, and rod, *p*, running along the top of the beam, *f*, rests above the chain in such cavity; the handle at the lower extremity of the rod, *q*, being drawn towards the main upright, *a*, will turn upon its centre or stud, *r*, and force the end of the locking-rod, *p*, into the recess, *o*, thus locking or wedging the chain between the rod, *p*, and the pulley, *g*.

The operation of weighing is as follows:—The chain or rope to which the goods are attached having been properly placed over the pulley, *g*, and under the pulley, *h*, and thence on to the winding apparatus, the goods are attached by the hook or otherwise to the chain, and are raised or lowered, as required, by the winding apparatus; during their suspension the lock rod, *p*, is forced into the cavity, *o*, in the "jib head," thus holding the goods steady for weighing. The handle working the excentric, *l*, is now moved, to draw down the rod connected with the narrow end of the beam, *f*, and throw it upon its fulcrum, *d*; the weight now being upon the weigh-beam, *f*, is transferred or imparted to the steel-yard, *i*, upon which the adjustment of the balance takes place, and from whence the true weight of the goods can be read or ascertained with greater readiness than if the weigh-beam, *f*, were graduated for such purpose, such principle being equally practicable with the arrangement before described. The crane can be thrown into its former position (namely, that of the ordinary lifting crane without the weighing apparatus) by raising the handle and excentric, and thus allowing the beam, *f*, to bear upon studs, *e*, in lieu of upon *the fulcrum, d.*

ON TONNAGE REGISTRATION AND MERCANTILE STEAM TRANSPORT.

It would seem that the object for which Mr. Atherton has been long agitating, has now assumed something of a practical form, as a Committee has been appointed by the British Association for the Advancement of Science to consider the question of measurement of ships for tonnage and other questions of a cognate character. We do not quarrel with the composition of that Committee, for along with the names of Messrs. Atherton, Peake, and Henderson, who have committed themselves to certain views, we observe the names of other gentlemen, some of them eminent for scientific ability, and others for skill as practical shipbuilders, which holds out a prospect of impartiality in the conduct of its deliberations. We would venture to remind the Committee so appointed, that a duty of no small responsibility is intrusted to them; for it is in their power, according to the spirit and judgment displayed by them in the exercise of their functions, either to further or seriously damage the cause of science as connected with the art of ship building. Those members of the Committee especially who represent mainly the scientific element in its composition, would do well to bear in mind, that the cause of science would be damaged rather than served by any attempt to attain a scientific object, irrespective of the important modifications which the legitimate interests of shipbuilders and shipowners demand; and that a moderate advance, if attainable, is more really useful than the most *perfect system* which is practically unattainable.

The first thing the Committee will have to do, is to obtain a clear insight into the question as it at present stands, and the real objects proposed for its consideration.

It was with this view that Mr. Atherton laid before the British Association the paper which we published in numbers 1724 and 1725 of our Magazine, and we now propose to give a short *resumé* of these objects for the benefit of our readers.

First, then, we must congratulate Mr. Atherton on the greatly improved tone of his observations as laid before the British Association compared with his paper read before the Society of Arts, on May 16, 1855, and January 16, 1856. That exuberance of philippic in which Mr. Atherton revelled in these two extraordinary documents, has been happily submitted to the useful discipline of the pruning knife, and the weak points of his previous suggestions are carefully kept out of sight. We can indeed clearly trace throughout his last volume the wholesome effects of our articles published in April, May, and June last, and we are convinced that Mr. Atherton is now in a much safer path for the securing of an impartial and unimpassioned consideration of the scientific features of naval architecture and steam transport economy, than he was after his indiscriminate attack on the Mercantile Shipping Act of 1854, in January last.

The questions to be considered by the Committee of the British Association are two fold:

First, the defects of the present system of registration of tonnage and of steam power.

Secondly, the best mode of applying a remedy for these defects.

Now, with regard to the first of these points, Mr. Atherton is more successful than he is in the second. It is always easier to detect defects than it is to raise a faultless construction. In his observations on tonnage registration, laid before the British Association, Mr. Atherton carefully separates the scientific from the fiscal view of this question, and herein we think he has acted wisely. In summing up the objects which he considers would be served by his paper read before the Society of Arts in January, he says: "By this paper I brought forward certain suggestions for public consideration and discussion, with a view to our official registration of shipping being rendered more comprehensive for the fulfilment of the various useful purposes to which statistical registration, if complete, would undoubtedly conduce in a scientific point of view, *irrespectively of merely fiscal objects.*"

We rejoice to find that, in accordance with our suggestions, Mr. Atherton now brings his proposition forward, as *in addition to, not subversive of* the Tonnage Registration of the Act of 1854. Allowing therefore the measurement for fiscal purposes to remain on its present basis, it will be for the Committee to consider whether the interests of the public do not demand the enactment of a further registration *solely* with a view to scientific objects.

Some definite displacement of a vessel involving the settlement of the whole weight when fully equipped for sea, is a necessary

datum for any scientific inquiry. It may then be a question worthy of consideration, whether the constructor of every vessel may not be required to furnish to the Board of Trade for the purpose of registration, what he designs to be the vessel's load displacement, which, in all probability will not be practically either much exceeded or much fallen short of.

It appears from Fincham's "History of Naval Architecture," as Mr. Atherton has several times reminded us, that in vessels of war the constructor always fixes and calculates the load displacement, and there seems no reason why this course should not be pursued with regard to merchant ships.

It is a further and a very different question whether the owners of ships should by law be prohibited from loading their vessels beyond this load displacement. It would be better, in our opinion, to keep this part of the question entirely separate from that which bears a scientific aspect. While shipbuilders and shipowners might, and probably would, resent any attempt to fix by legislative enactment the exact limit to which vessels *might* in any case be loaded, we do not anticipate any great repugnance on their part to register what may be taken as the mean fair load of the ship, which is all that in a scientific point of view is of importance.

It is probably the case, as Mr. Atherton observes, that there is some little ambiguity at present as regards the term *Tonnage*. The measurements under the several acts of 1733, 1833, and 1856, are essentially different; but then, it must be borne in mind, that only the two latter of these have any reference whatever to the *registered* tonnage of ships; the former has only been preserved to enable persons interested in shipping to form *some idea* of the size of a vessel. As we have said on a former occasion, no legislative enactments can be devised to protect the buyer of ships from the losses incident to want of common sense and common experience. There must be something to learn in every trade; and we are confident, that shipowners and shipbuilders laugh at the idea of persons engaged in the act of buying and selling ships professionally being confused between the several meanings which the term Tonnage may bear. No person has a right—morally, of course, we mean—to engage in transactions of this kind, unless he is acquainted with the technicalities of the trade, any more than a person has a right to deal in drugs unless he knows the difference between Epsom salts and strychnine. The shipping interests require no protection of this kind, nor can they be expected to receive without suspicion specious offers of protection which they *have never asked for*, and which they must imagine cloak some ulterior objects which bode them no good. *Timeo Danaos et dona ferentes.*

A knowledge, however, of the weight of cargo *designed* to be carried by each ship, being the difference of the construction registered load displacement and light displacement (if it should please the legislature to require such registration), would supply all the information that could be fairly required for statistical purposes.

So much for the defects of the law as regards tonnage registration.

It seems, however, that the registration or calculation of horse power for mercantile purposes is equally defective. Mr. Atherton, we think, has fully succeeded in establishing this part of the case. The nominal horse power of an engine gives no indication whatever of the real power to which it can work; for while some marine engines will work only up to twice, some will work to four times the nominal power. It is therefore evident, that from a knowledge of the nominal horse power of an engine no inference can be drawn of it as to its efficiency. To test the value of a vessel propelled by steam in a mercantile point of view, we require to know the *weight* propelled and the power actually exerted in propelling it, and also the *speed* at which it is moved. Hence it will be for the Committee to consider whether it would not be for the public advantage, that some more efficient mode of estimating the real power of an engine is not a desideratum, which the legislature may fairly be called upon to supply.

But although we agree with Mr. Atherton, that in a scientific point of view, a more correct mode of estimating horse power is required, we are by no means convinced that the competition amongst engine makers to produce engines, which under the smallest possible compass shall give the greatest power has not been attended with advantages greatly counterbalancing the admitted defects. So far from believing that every fresh vessel of improved form and steam power application only benefits the owner by giving him the same freight which the vessel of bad form is obliged to charge for the indemnification of the owner, we believe on the contrary, that the advent of every such vessel tends to lower freights; not perhaps to such a degree as would be the case were none but vessels of a good type in the field, but so as to give the public a good share of the advantages resulting from the adoption of good types of build and efficient adaptation of steam power; and so as in a moderate number of years materially to lower the average freight charge for every ship. It is impossible that the average freight should be that of the vessel of the newest and

most improved type; all that may be fairly demanded is, that in order to compete with such a vessel, which for the interests of the owner would carry cargo at a lower freight than other ships, the builder must construct all new vessels on *improved*, and not on bad, or even indifferent lines.

This, we believe, to be the history of the great improvements which have undoubtedly been made in mercantile steam shipping of late years. And it is, we believe, doubtful whether under the present system the public interest has not been consulted as efficiently as though "the statistical grindstone" had been as perfect a machine as possible. At all events, we think Mr. Atherton has somewhat overstated his argument in this part of his case.

We do not purpose entering here upon an examination of Mr. Atherton's arithmetical calculations, and of the formula on which those calculations are made. We are content to allow that, without being strictly in accordance with theory, the formula in question is practically sufficiently well adapted for the purpose, and that Mr. Atherton's calculations are not far from the mark.

That there are such *deficiencies* in the registration of tonnage and horse power as to render all scientific inferences drawn from these data valueless, must be admitted. If it is advisable to enforce by legislative enactment a remedy for these defects, the next question, and that one of no small difficulty and delicacy for the Committee of the British Association to consider, will be in what form can that remedy be best supplied? Mr. Atherton in his previous paper and essays on this subject, has suggested remedies which he has formally laid before the Committee. We have so lately examined the value of his improved registry for tonnage, that we do not think it necessary to enlarge on that topic now. Suffice it to say, that the registered load displacement, to serve every scientific purpose, must be as accurately calculated as the most approved modes of approximation will allow: and, as we have fully shown, Mr. Atherton's proposed method is a signal failure, as far as regards this most important element.

To remedy the other defects in the marine horse power registration, Mr. Atherton simply proposes to substitute the unit of 100,000 lbs. raised 1 foot high per minute for that 33,000 lbs. so raised. The particular unit of 100,000 is fixed upon, because it appears that the real horse power developed varies between 2 and 4 times the nominal power.

But how would the adoption of this new unit bring the nominal and real power into complete harmony? Still the nominal power of some engines would be 33 per cent. less, and others 33 per cent. more than the nominal power. What is required is, that the registered horse power or nominal horse power should really represent the effective horse power, so that the numbers representing these quantities should be sufficient data for making a true comparison of the locomotive merits of different ships. *Any unit whatever* would answer this purpose, provided the nominal power and the effective power were represented in each separate case by one and the same number of such units. The only advantage that we can see, in adopting the new notation, would be to diminish the number representing the indicated horse power, and so to raise the coefficient C in the formula $\left(\frac{V^3 D^{\frac{4}{3}}}{\text{Ind. h. p.}} = C\right)$ to about three times the value it would otherwise have; and to bring the nominal and real horse powers to coincide to within one-third of the whole amount in excess or defect. Whether it is worth while to unsettle the present system merely to adopt *such an improvement*, we leave our readers to judge. It appears to us that Mr. Atherton would have done more service to science, and would have put the Committee on a better track, had he brought his experience and his means of procuring information from engine makers to bear upon the question of establishing some such relation between the proportions of the several parts of the engine *and of the boilers*, as to deduce a rule for the calculation of nominal power which should be at the same time the effective power of the engine.

As to Mr. Atherton's proposed unit, it seems to us to be a matter of perfect indifference whether it be adopted or not. The real desideratum remains as much a desideratum as ever.

Such, it appears to us, is the present state of this question, so much agitated of late by Messrs. Atherton and Henderson. Such, as we have endeavoured to faintly point out, is the nature of the investigations which it is incumbent on the newly-appointed Committee of the British Association to pursue. In conclusion, we would again express our opinion that they will best serve the cause of science by keeping a broad and well defined distinction between the scientific objects sought to be attained, and any legislative enactments which may have for their end to compel the shipowner not to exceed a certain specific limit in the loading of his ship.

MR. BESSEMER'S DISCOVERY.

THE following account of a few experiments made at the Royal Arsenal, Woolwich, has been communicated to the Secretary of the Society of Arts, and published in the *Journal* of that Society:

"1. A mass of iron, about 15 ins. long by 6½ square, made from Blaenavon pig, just as it came from the iron mould into which it had been poured, was heated in the scrap forge, and reduced to a conveniently sized "bloom" under a one ton Nasmyth hammer. The appearance of the fracture of this mass, before heating, was similar to that usually described, viz., crystalline, porous, and of a brilliant lustre.

"2. The bloom worked very stiff and rigid, and when sufficiently reduced was passed through the rollers, and made into a bar 2 ins. wide by 5 thick. Cut with the shears when hot, a good incision was made to about one-third of the thickness, and the remainder fractured in the operation. Another portion of the same bloom was hammered into a short inch square bar under the same hammer, and when cut hot presented the same result.

"3. When cold, the first-named bar, once hammered and once rolled, had a nick cut all round, and was broken short off on receiving a blow with a hammer. The fracture clean, laminated as if the crystals were squeezed by the pressure into horizontal layers; no fibre.

"4. The two portions faggoted, heated, and hammered into a cylinder of 1 inch diameter; nicked all round, broken with a blow, a clean fracture, no fibre, the first crystalline appearance *restored*, as if the crystals had been simply pressed back by hammering in a direction contrary to the first.

"5. The two portions faggoted, heated, and hammered to the same dimensions, a slight nick made on *one* side, fractured by a blow, with the same result. Impressions of the fractured ends were taken in lead, and when compared at each fracture, had the same appearance, with no increase of fibre.

"6. One portion of the last-made bar accurately turned, and placed in the machine for testing the tensile strain. A portion of the fracture had an oxidised appearance, which portion was the first to give way, and without appreciable elongation. The iron worked harsh and rigid under the hammer, but well and pleasantly in the lathe. My experiments having been generally with cast iron, I regret not having many with wrought iron for comparison, but you will easily supply them.

"The diameter of the specimens at the line of breakage = ·6-inch.

"The breaking weights are the means of two specimens, except in that by Bessemer's process, one only being tested.

Nature.	Breaking weight in lbs. per square inch.	Elongation before fracture.	Diminution of diameter before fracture.	Remarks.
		Inch.	Inch.	
Wrought iron made from Magnetic ore of Londonderry, Nova Scotia	66,491	.109	.123	Fibrous fracture.
Wrought iron made from Catalan bloom, hæmatite and specular ore of Londonderry, Nova Scotia	59,594	.332	.199	Ditto.
Wrought iron made from Magnetic ore of Nictau	67,905	.232	.146	Ditto.
Wrought iron made from Shell ore of Nictau	61,039	.234	.204	Ditto.
Bessemer's process (heated and rolled once, heated and hammered four times,) preserving the *laminated* appearance to the last	65,999	.113	.014	Crystalline partially oxidised.

"CHEMICAL ANALYSIS.—A portion of the ingot, taken before making the bloom, selected with great care from a solid inner portion of the mass, so as to avoid cavities, fissures, or fused portions of oxide of iron, &c., was submitted to examination. No silicium whatever was detected. No trace *of graphite*, or of uncombined carbon. *Combined carbon not* exceeding 0·3 per cent. Phosphorus 0·44 per cent. Sulphur 0·056 per cent. A similar result was obtained some months ago from a sample produced by the same process by Mr. Bessemer, from another description of iron. Blaenavon iron is comparatively free from these last impurities. For comparison, a pig was taken at random from a heap of Blaenavon iron, which yielded to the same

treatment the following comparable result:—Phosphorus, 0·48; sulphur, 0·062.

"P.S.—Since writing the above, I see in to-day's *Times* a letter from Mr. Bridges Adams, with these words:—'From that ingot has been forged at the Royal Arsenal, Woolwich, a "bloom," subsequently rolled into a *tough* bar 2 in. by ½ in., bearing all the mechanical indications of the *best charcoal iron*.' The italics are mine. This statement is so clear, that I can only suppose Mr. Adams must perhaps allude to some experiments in the Dockyard (though I cannot hear of any), because no other than the above have been made in the Arsenal."

We have much pleasure in adding the following paper, with which we have been favoured by Mr. W. Bridges Adams, in which the above communication is discussed, and other facts and suggestions are recorded.

"F. E. W.," dating from Woolwich Arsenal, gives in the *Society of Arts Journal* the first detailed account of experiments on forged iron produced by Mr. Bessemer's process, which I have seen in print. The bar he describes is 2 in. wide and *5* in. thick.* The bar alluded to in my letter to the *Times* of Sept. 9, was seen by me and many others at Baxter House, at the experiments of Monday 7th. It was some 15 ft. long, 2 in. wide, and bare half an inch thick. One end of it was bent round cold to a circle of 6 in. diameter, displaying considerable toughness; and being bent backwards, a piece was broken off, which was carried away by a friend of mine to experiment on. The fracture showed white and large grained crystals. I inquired where it was rolled, and was informed "at Woolwich Arsenal, being first tilted to a 'bloom.'"

I have before me a piece of the bar which has been partly cut through and broken. The broken part is crystalline, and the portion between the break and cut is laminated as described by "F. E. W." To the file, the iron is perfectly soft, without "pins" or hard particles, and with the back edge of a penknife small filaments are easily removable. These are mechanical indications analogous to those of charcoal iron. The quality appears to be homogeneous, but the lamination shows mechanical separation of parts, that is, porosity or want of solidity. But, nevertheless, it takes a very beautiful polish.

The chemical analysis is given by "F. E. W.," but it would have been more satisfactory had he given the comparative analysis of the other irons against which it was tested. Nothing is said of specific gravity—an important element.

In the breaking experiment Bessemer's iron proved crystalline; the other four specimens were fibrous. It is therefore certainly very remarkable how closely the crystalline approached to two samples of the best fibrous in strength, while it exceeded the other two. This is a very important matter, for granular iron is for many purposes preferred to fibrous; as for the tyres of railway wheels, wherein fibre laminates and treads out into strings, and is only endured in frosty climates, as Russia and Canada.

Those who have witnessed the casting of the ingots, will have remarked that the blast which permeates the mass of molten iron is continued during the process of pouring out. In fact, it pours out aërated, like so much champagne, and is received in a cast iron mould, which tends to chill the mass on the outside, and leave the centre reedy and hollow. Probably this plan has been adoped for its facility of showing the experiment rapidly, without having to dig the ingot out of sand. The best plan has not yet been adopted for obtaining dense ingots. In castings it is customary to let the metal rest before pouring out, and to cast with what is called a "head," squeezing out the air-bubbles below with weight of metal above. Even in brass this is done. But the castings of Mr. Bessemer have hitherto all been made apparently so as to ensure the least density in the ingot. Globular pores appear to be squeezed flat in rolling, and to induce lamination analogous to beating up small shot into a mass.

The experiment at Woolwich—re-heating a cooled ingot—does not seem favourable to the production of dense non-porous metal. Once set, it is probably very difficult to close the pores in the interior of a mass, just as it is difficult to make a cool rivet fill a hole. The external part feels the influence of blow or pressure which does not get to the interior.

Probably the best method would be, after allowing the metal to subside, to cast it in heated moulds, to form a vacuum while subsiding, and to put the mass under pressure as soon as it may be set, and then transfer it to the hammer and rolls.

What is fibre in iron? In wood, fibre is a mass of strings held together by a gummy substance. In a woollen cord the fibres are held together by twisting. Pro-

* It appears to us probable that "F. E. W." wrote "2 inches wide by ·5 thick," and that the decimal point was omitted by the printer of the *Journal*. On this supposition the bars seen by "F. E. W.," and Mr. Adams were similar.—Ed. M. M.

bably the fibre in iron may be produced by some intervening substance, separating the iron into strings in the process of squeezing. We do not yet understand this matter. Granular iron is probably the same as fibrous, with the difference that the intervening substance in fibrous iron lies in one direction in strings, and in the granular in broken strings lying in all directions. Molten gold, silver, copper, and lead are as homogeneous when cast as when wrought, though not so dense. Probably iron pure and absolutely free from any other substance may ultimately be got to the same condition. These considerations open up the question of what is crystallization in iron? Lamination is striation in sheets; fibre is striation in strings; crystallization striation in irregular net-work. In neither case is the metal homogeneous, and this opens up the question whether the crystallization is caused by the molecular arrangement of parts of pure material, or by the interposition of some other substance,—a question to be solved by the chemist, possibly with the aid of a powerful microscope. But I think it will be found that each separate crystal is pure soft iron. These views are the result of simple thought, building up a theory without the means of verification at hand.

The great fact in Mr. Bessemer's process is, that in a clay colander, he produces, without fuel, an intenser heat than has before been produced with fuel, and by a rapid operation without manual labour, a result of malleable iron ten times in amount of what has hitherto been produced at considerable cost of fuel by a slow process.

Since the process became public, I have been informed that an amateur chymist has performed it on a small scale by very simple implements. Running down four ounces of cast iron in a crucible, he poured it into the large bowl of a tobacco-pipe previously heated, using the stem as a blowpipe till the process was complete. Any of your readers can try this simple experiment.

But it is a fitting proceeding for the authorities in Woolwich Arsenal to exhaust the subject. Without getting ingots from Mr. Bessemer, they should take the ores direct of various makes of iron, and,

First. Reduce them by the ordinary processes, and puddle them, or refine and puddle them.

Secondly. Reduce them by the ordinary processes, and run the iron out into Mr. Bessemer's clay colander, and make it malleable.

Thirdly. Reduce the ores by the ordinary processes, and then, with Mr. Bessemer's apparatus, subject the iron to every variety of probable gaseous substance.

Fourthly. Reduce the ores by the ordinary processes, and mix the iron with lime and other substances in Mr. Bessemer's apparatus.

Fifthly. Vary the length of time Mr. Bessemer's process is continued, from the first commencement of scintillation to a period as long as heat can be kept up.

Sixthly. Reduce the ores, and mix them with all probable chemical substances in the ordinary furnace.

Seventhly. Provide for the subsidence of Mr. Bessemer's iron by slow process, keeping it fluid as long as may be possible.

Eighthly. Forge samples of each iron in dies, to attain the maximum density.

"F. E. W." states that phosphorus and sulphur are found in Mr. Bessemer's iron in nearly the same proportion as in the Blaenavon pig from which it is prepared. There are two indications of the course to be pursued; first, to ascertain whence comes the phosphorus and sulphur—from the ore, the fuel, or the fluxes; secondly, if heat be not sufficient to expel them, what chemical additions are required to neutralize them?

When the experiments are complete, tabulate them, giving the chemical analysis, specific gravity, tensional strength, torsional strength, ductility, rigidity under compression, power of resisting atmospheric oxydation, and comparative cost of production. The six last conditions are the conditions of general utility.

It will not be creditable to us nationally, if our public establishment, our chief arsenal, does not work out this great problem of exhausting the subject of iron production, conversion, and modifications. An individual has, at his own cost, turned over a remarkable leaf in the great book of nature, and literally, with "great labour and expense," given us a kind of Rosicrucian alembic in which fire burns without fuel; and it is desirable that the national laboratory should advance more than *pari passu* with the individual manufacturers in the opening future, confirming or combating the statements which individual interests may be supposed to bias.

Since the first reading of the paper before the British Association, experiment proper there appears to have been none made by Mr. Bessemer, but a mere repetition of duplicate meltings, in presence of the thronging curious and the thronging interested. I am now informed that a hammer is about to be erected on the premises; not a steam hammer, but an air hammer; that is, a hammer lifted indirectly by steam, with a cam movement, and forced downwards by the elastic action of compressed air in addition to its own gravity. What is commonly called a steam hammer, is not really so, but simply a gravitation hammer, lifted by

steam directly, instead of indirectly. We shall thus get at the next stage in the process.

Belief in disinterestedness is not a weakness to which human nature is generally prone; and it would be but worldly wisdom in any one possessing the weakness of disinterestedness, to deny it, and assume an interest, if he have it not. If he cannot show an ostensible interest in any subject he may advocate, he will be suspected of a concealed one, for the world firmly believes that "nobody gives nothing for nothing." In advocating this new process of iron-making, I am fortunately able to fall in with the world's views, having a very strong interest in it—generally as an advocate for the substitution of iron for timber in buildings by sea and land—and particularly in the application of it to my own "Suspended Girder Rail," which will then be not merely as cheap, but considerably cheaper in first cost than the wasteful timber structures; and if the semi-steel of Mr. Bessemer turns out a true process, we shall obtain a safe, cheap, and really *permanent* way.

I am interested in another thing, in which I believe I am backed by the generally chivalrous spirit of the English nation; viz., that the inventor, who is our constant prop and stay, our watchman—vigilantly guarding us against falling into the condition of Chinese—should have fair play and ample remuneration.

If your readers will refer to a paper read by Mr. Kenyon Blackwell, on iron manufacture, before the Society of Arts, it will be seen how very remarkably he hovered round the then undiscovered process of Mr. Bessemer, in all his remarks on iron puddling.

I have one more remark to make, not on the humanity, because it is considered bad taste in trade to talk of humanity, and to savour of humanitarianism, anti-cruelty to animals, and "that sort of thing;" but on the mere score of political economy, what an important item it is in Mr. Bessemer's process to get rid of the necessity of employing human puddlers. To produce, feed, and train a workman to the age of twenty, costs a given sum. Puddlers are worn out at forty years of age; other workmen work till fifty and sixty. Therefore the capital invested to "raise" a puddler is sunk and expended in twenty years, while the same capital expended for other workmen lasts for thirty and forty. Depreciation of human stock is a large item in puddling. I again beg to state that I am talking political economy, and not humanity.

VULCANIZATION OF INDIA RUBBER.

No. II.

In our last number we entered so far into this remarkable discovery of Mr. Goodyear as to show in what the vulcanized gum differed from the natural substance, and perhaps here it will be as well to state how vulcanized India rubber may be tested, and the line of demarcation practically drawn between the two.

Camphine or turpentine, oil of sassafras, and all the essential oils, are faithful tests of the quality of gum elastic, and as certain in their tale-telling as nitric acid is of the genuineness of gold. As the native gum, and also the common manufacture of gum elastic, have the same general appearance as those that are vulcanized, more particularly to persons not acquainted with the manufacture, nor judges of the goods, these tests are of the utmost importance, not alone to determine whether the goods are genuine, but also to ascertain whether those that are vulcanized are properly done. When these tests are applied to any fabric of native gum it is rendered very adhesive, and so quickly as to destroy any light fabric almost immediately, while upon goods that are well vulcanized they should have no such effect. If they do so, the manufacture is bad.

Although the manufacture of hard India rubber goods by the process of vulcanizing is extensively known and appreciated in the United States, and in France and Belgium, very little appears to be understood in Great Britain. Indeed in Birmingham, which is justly termed "the workshop of the world," little or nothing—or if anything a something amounting to a misunderstanding, would comprise the quantity of intelligence upon the subject. There can be little doubt, however, that as the infinite capabilities of the material become known and justly esteemed, and its amazing applications get manifested, no one thing of late years, surprising as the changes have been in that neighbourhood, will have caused so great a revolution in very many of the staple manufactures of that town as will the introduction of this discovery.

As regards the power to be used in its manufacture, steam has a decided advantage over water, as in the plastic state of the mass there exists a variety of proceedings, according to the nature of the material to be made, or the object to be imitated, in which steam would have to play a conspicuous part. But it must be in this country as in America and elsewhere, that as the manufacture extends, so will the best and most suitable machinery and power be

devised and rendered subservient to its development. When the manufacture is favoured with the advantages of steam power and large capital, the most profitable results have been and are attendant upon it. And perhaps there are few manufactures which require less comparative space, and in which less waste is consequent. There should not be a particle of the substance lost, as all cuttings, the sweepings of the factory, and the very dust upon all things around, can be reworked with profit and advantage. Indeed, it is here that we should make publicly known the fact that every article of vulcanized India-rubber bears its value according to its make and kind, however old it may be. As a general impression exists that India-rubber when once vulcanized cannot be again used, this statement should be borne in mind, and the greatest publicity given to it, in order that the millions of pounds now lying waste in the shape of galoshes, &c., may not be heedlessly thrown away. The old Jew clothesmen will at once open their eyes to the fact, and the valet or humble servant-girl will find in their collection and sale an increase to their perquisites, in proportion to the consciences of those with whom they deal. Here, then, we have important elements of economy at the very beginning and end of the manufacture, if end that can have which has the attribute of a renewal of usefulness. Galoshes may be called in as worn-out sovereigns and shillings are now, and, returning to *their* mint, be melted up and restamped for renewed circulation.

Another advantage in the manufacture is, that the same tools are employed for its various branches, and the same operatives can be turned from the making of one description of article to another without delay or expense. A girl, for instance, who may be engaged as the maker of garments one day, may become the next a trunk, a harness, or a shoe-maker; and on the third find herself occupied in pressing out of the soft and ductile mass, brooches and other articles of adornment, which being afterwards vulcanized, and thus rendered almost imperishable, may serve to encircle the neck, clasp the arm, or hang pendant from the waist of Britain's fairest daughters.

The machinery employed in the manufacture of India rubber, since the first attempts to work it, has been subjected to variation and gradual improvement. Numerous expedients and divers machines were early tried for chopping, grinding, and spreading the gum, and also for flowing it in a liquid or semi-liquid state, which have been abandoned. It is now generally agreed by *manufacturers* in this business, that the *machinery is as near perfection* as can be attained; that is to say, they are all satisfied with it, but in this age of improvements, we might see to-morrow one machine doing the work of two or more, and all calculation as to perfectibility obliterated but to begin again upon fresh data. It must, however, be admitted that it is of the most simple kind, doing the work well and with astonishing rapidity, although requiring great mechanical power, owing to the toughness and tenacity of the gum. The machine used for cutting and washing the gum is the same as that employed by paper-makers in cutting rags. A large proportion of the India-rubber was nearly useless from the quantity of bark in it, until this engine came into use.

Gum elastic, or India-rubber, can be readily mixed or combined with almost every other substance. It may be mixed with other gums, oils, coal-tar, carbon, and with the earths and oxides, or pulverised metals and ores. It can likewise be combined with all fibrous products. It is compounded in the manufacture with many of the above substances, for the purpose of obtaining particular advantages for special uses. Ground cork and other light materials are sometimes mixed with the gum to increase the bulk and make the articles light.

The oxides of metals, their filings and pulverised silicas, will give imitations of marble. The fibre of cotton or the dust of different woods will afford simulations of wood of greater or less gravity, as may be required. The combining of plumbago gives the crayon, oxide of zinc produces lithographic stone, and so on, *and on*.

Pigments and earths are used for colour and cheapness, and to increase the weight of the fabric, as in the case of carpeting. Bitumen and resin are sometimes used to give articles a finish or high lustre. Oxides of some of the metals are used, but white lead and litharge are commonly preferred. From two to four ounces of either of these metals to the pound of gum cause the articles, and particularly those that are thick or massive, to be more readily changed or vulcanized, and more completely, or with greater uniformity. Sulphur is applied through the medium of heat in different ways according to the nature of the articles or fabrics and their uses. It is generally mixed in the process of crushing or grinding the gum in the proportion of half an ounce of sulphur to the pound of gum for the vulcanized elastic goods, and about five or six ounces to the pound of gum for the "vulcanite" or hard goods. In the former case about 270° of heat are necessary, and in the latter 300° to 310°. At other times the sulphur is dusted upon the articles in the form of flour of sulphur before they are placed in

the heater or oven. This is commonly done in the manufacture of elastic thread and other articles which possess no extraneous mixture, in which case the gum is penetrated or impregnated with the sulphur without its being mixed with the gum in the crude state.

Enough has been given in this chapter to permit of the intelligent and thoughtful at once following us in the manufacture and finish of—we will say, for example—buttons. The mass in a tough but plastic state—a toughness and plasticity in combination with which there exists no approachable parallel—having been so rendered by simply plunging it into boiling water, becomes as easy of manipulation as clay. Indeed the material in this stage being so like clay, we can scarcely point to any better illustration than the porcelain button manufacture, which being familiar to most, there can be no need to detail. Treated thus like clay, the moulds may be filled by the gross, and the buttons afterwards submitted to vulcanization. The moulds may bear any impress; and however fine such patterns may be, the material will receive and retain them after vulcanization to a degree which will defy every power that destroys all other substances short of those of actual cutting, filing, or grinding. Thus a button is produced at an extraordinary economical rate, and with marvellous ease, which, while comparing the facility of its origin to that of the porcelain, possesses the superlative qualities of being comparable with one made with the properties and strength of iron or other metal, and in imitation of bronze, of ivory, of cameos, and is, indeed, a substitute for any other, and the very best material or thing ever used for button making. In a word, it may possess the closest similitude to the most exquisite carving, with the properties of bronze, ivory, or any hard and scarce material. The applications, as far as results are concerned, are attended with like favourable characteristics, whether the article produced be nearly every one of those innumerable and familiar things which meet us at each turn, either within the palace or the cottage, or the many others to be met with out of doors.

Since writing the above, we have heard that several examples of the abilities of the material to supplant many substances now used in the arts and manufactures have been taken from the Vulcanite Court of the Crystal Palace to Birmingham, where they have been inspected by the leading bankers, merchants, and manufacturers, with an earnest attention and eager inquiry, which, it may be safely inferred, are the first indications of extensive operations in that neighbourhood. The workshops, &c., have likewise been liberally thrown open for experiment, and demonstration has served there, as elsewhere, to prove the immense value of the discovery to the services of mankind.

We would suggest that Sheffield should be equally cared for, as the imitations of ivory, buckhorn, &c., with the additional advantages of standing great heat, hot water, and concussion without splitting,—more particularly at the rivets,—would insure no ordinary welcome, the more as the cutlers and others of Sheffield are using every effort to make known their wants for substitutes of those materials, now becoming extremely dear and scarce, which have been hitherto used for the handles of knives, tools, &c. In conclusion, we should state that for the handles of chisels and other workmen's tools subject to concussion, the vulcanite possesses the rare quality of permitting the hardest blows being dealt by the *hammer* or the mallet indifferently.

(To be continued.)

VICTORIAN DECIMAL SYSTEM.

(Continued from p. 253.)

NOMENCLATURE.

Measures of Length.

10 Teks ..1 Fil. 10 Rods ..1 Chane.
10 Fils....1 Aet. 10 Chanes 1 Kord.
10 Aets ..1 Enk. 10 Kords..1 Leeg.
10 Enks ..1 Ped. 10 Leegs..1 Voy.
10 Peds ..1 Rod.

1 Aet=1·0 eighth of an inch.
1 Ped=100·0 eighths of an inch, or 12½ inches.
1 Leeg=1·973 Mile nearly.

Measures of Surface.

10 Cheks..1 Prode. 10 Aers ..1 Rood
10 Prodes 1 Tave. 10 Roods..1 Morg.
10 Taves..1 Lit. 10 Morgs..1 Kide.
10 Lits ..1 Slade. 10 Kides..1 Brale.
10 Slades..1 Aer.

1 Chek = 1 Square Enk = 1·5625 square inch.
1 Rood=0·9964 Rood old.

Measures of Capacity.

10 Goots ..... 1 Crist.
10 Crists ..... 1 Rame.
10 Rames..... 1 Flone.
10 Flones..... 1 Horn.
10 Horns..... 1 Galon.
10 Galons ..... 1 Ferken.
10 Ferkens ..... 1 Ponchen.
10 Ponchens .... 1 Last.
10 Lasts ..... 1 Ploat.

The Goot is the cubic Aet.
The Galon=0·7044 Gallon.
The Ferken=0·8806 Bushel=A cubic Ped.
The Ponchen=1·1007 Quarter.

Measures of Weight.

10 Cules ..... 1 Grane.
10 Granes ..... 1 Fave,
10 Faves ..... 1 Drame.
10 Drames ..... 1 Ounze.
10 Ounzes ..... 1 Libe.
10 Libes ..... 1 Clove.
10 Cloves..... 1 Heke.
10 Hekes..... 1 Taf.
10 Tafs ..... 1 Stol.

The Grane is the weight of a Goot of water =2·02799 grains.
The Ounze „ „ Flone „ =1·12708 oz. Avoir.
The Heke „ „ ferken „ =70·44256 lbs. Avoir.

If the Ferken of water be made 40 Libes, the Heke will then be equal to 176 lbs. Avoir., and we shall have exactly 10 sovereigns to the ounze, and each sovereign will be a dram weight. The Mint price of gold will be £10 the oz., £1 the dr., 1 F. the Fv., 1 c. the gr., and 1 mil the cule.

Measures of Work and Power.

10 Pedlibs ..... 1 Rodlib.
10 Rodlibs ..... 1 Chalib.
10 Chalibs ..... 1 Korlib.
10 Korlibs ..... 1 Leelib.
10 Leelibs ..... 1 Rostol.
10 Rostols ..... 1 Chastol.
10 Chastols..... 1 Kostol.
10 Kostols ..... 1 Lestol.
10 Lestols ..... 1 Vostol.

The *Pedlib* of work is=0·7338 footpounds. The Rostol of work is a stol of pressure applied through a rod of space. A Rostol of power is a Rostol of work done in a minute of time, and is=2·2236 H. P. of Bolton and Watt. The H. P. of Bolton and Watt=44·9728 Korlibs.

Indicated power of H. M. S. *Conqueror* =1·266 Lestols or 1266 Rostols.

PREFIXES TO BE USED WITH THE VICTORIAN MEASURES AND WEIGHTS.

Measures of Length.

10 Milliteks .... 1 Centitek.
10 Centiteks .... 1 Decitek.
10 Deciteks..... 1 Tek.
10 Voys ..... 1 Decavoy.
10 Decavoys .... 1 Hectovoy.
10 Hectovoys .. 1 Kelovoy.

Measures of Surface.

10 Millicheks.... 1 Centichek.
10 Centicheks .. 1 Decichek.
10 Decicheks .... 1 Chek.
10 Brales..... 1 Decabrale.
10 Decabrales.... 1 Hectobrale.
10 Hectobrales .. 1 Kilobrale.

Measures of Capacity.

10 Milligoots .... 1 Centigoot.
10 Centigoots .... 1 Decigoot.
10 Decigoots .... 1 Goot.
10 Ploats..... 1 Decaploat.
10 Decaploats.... 1 Hectoploat.
10 Hectoploats .. 1 Kiloploat.

Measures of Weight.

10 Millicules .... 1 Centicule.
10 Centicules .... 1 Decicule.
10 Decicules .... 1 Cule.
10 Stols ..... 1 Decastol.
10 Decastols .... 1 Hectostol.
10 Hectostols .... 1 Kilostol.

Measurement for Astronomers.

10 Millirads .... 1 Centirad.
10 Centirads .... 1 Decirad.
10 Decirads..... 1 Rad.
10 Rads ..... 1 Decarad.
10 Decarads .... 1 Hectorad.
10 Hectorads .... 1 Kilorad.
1 Rad = the earth's radius = 200·5283 Voys.
1 Centirad = 2·005 Voys.

These Prefixes are only for Scientific uses.

J. S. H.

TRADERS' INSANITY.

THE PEOPLE POISONING THE PEOPLE.

THERE is no use in continuing to abate the above crime (the adulteration of food and drink), by the hitherto trite way of procedure. I ask at once, how can that human being rest, conscious of having all day long *robbed*, and in many (*most?*) instances *poisoned*, his fellow-men? Why, the thing is so monstrous that nought but a Shaksperean tongue would be congruous to cope with it. We medical men know well what effects even the minutest dose of drugs (say, applied homœopathically) will have on the human frame, if used continuously for any length of time! Now, let us fancy what the day by day, nay, hour by hour, introduction of alum, cocculus indicus, strychnine, saltpetre, dissolved flints, &c., will and must produce, especially on the sickly, the weak, the infant! The very apprehension or suspicion of being thus drugged horrifies any sensible person.

But have our sapient legislature never considered that there is a side to this affair which has not been even touched yet? I mean the absolute illegality of any master ordering his apprentice or journeyman to commit an illegal act; viz., to adulterate food or drink with *any*, or still worse, with noxious substances. I am convinced, that any order to commit an illegal act vitiates and makes void any indentures or other

agreement entered upon between master and men. If the statistics of crime begin to attract already general attention, I, for one, wonder that things are not even worse, considering how our shops, manufactories, &c., have become colleges, as it were, for cheating and defrauding each other.

One word of advice to the honest poor, to conclude with. Do *not* buy your necessaries (whenever you can avoid it) in obscure, crowded neighbourhoods; but send to Piccadilly, the Strand, Oxford-street, &c., for them. The aristocracy do *not* tolerate to be cheated and poisoned; it is only "the people poisoning the people"—as in times of old, Saturnus was said to *devour* his own offspring!

J. Lotsky.

15, Gower-street.

IMPROVED INSULATORS FOR TELEGRAPH WIRES.

Mr. Edwin Clark has recently introduced an improvement in insulating telegraph wires, according to which the arms and the caps, by which the suspension above the earth is accomplished, in place of being made separate in each case, are made of one piece of metal or other suitable material, and the cap and arm is made with a gutter to carry off rain from above the insulator, which is suspended within the cap.

Fig. 1 shows a side view, partly in section, of one form given by him to the arms

Fig. 1.

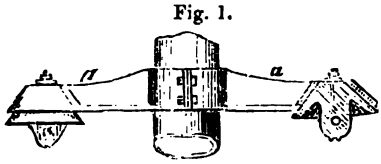
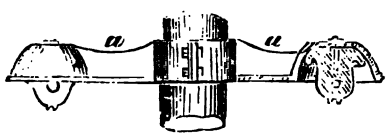


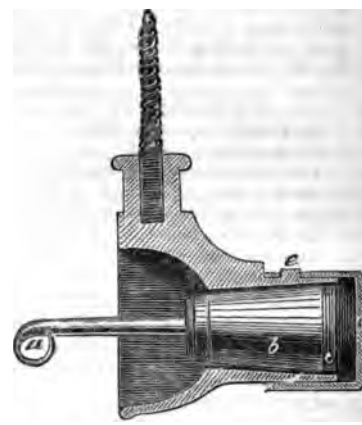
Fig. 2.



and cap; Fig. 2 shows a side view, partly in section, of another form. The forms of the arms and the caps may be varied so long as an arm and cap is in one piece, as shown. *a*, *a*, are the metal arms, terminating with inverted hollow metal caps of a suitable form for receiving the earthenware or glass insulator for suspending the wires. The caps are made with gutters around them, as shown. The arms and inverted hollow caps are best made of one piece of cast iron, though wrought iron or other metal may be used, and even earthenware might be employed.

Mr. John Woodman, of Manchester, has also introduced an improved telegraph wire insulator. Instead of cementing the stalk of the hook through which the wire passes into a thimble, and cementing the said thimble into a cylindrical chamber of a cast-iron bell, he makes the bell open at the back, with a cap or cover to fit closely on it. He fastens the stalk of the hook or eye into a conical shaped non-conductor, which he passes through the bell at the back. By its conical shape, the smallest part being foremost, it forms a wedge, whereby the more stress or strain comes upon it the tighter it fits, and thus becomes waterproof; and as an additional tightener, an elastic ring is put round the thick end of the non-conductor, which causes it to fit perfectly close, and the cap or cover being then put on, and secured by a peg or pin,

Fig. 3.



preserves it from the weather or accident. It is evident, that by this plan, whenever the hook or eye becomes broken or out of order, it may be taken out and repaired, or replaced with a new one, without disturbing the whole of the insulator, by merely taking off the cap or cover, and taking out the non-conductor and hook or eye.

Fig. 3 of the engravings is a view of the insulator complete. *a* represents the hook or eye; *b*, the conical shaped non-conductor; *c*, the elastic ring, and *d* the cap or cover which slides on the outside of the bell, and is secured by the pin or projection *e*.

PHOTOGRAPHY INVENTED IN ENGLAND.

The late Francis Bauer, F.R.S., and botanical painter, of Kew Gardens, related to me the following occurrence:—"It was

at an early period of the present century, that M. Niepce called upon me, showing me some specimens of an engraving or drawing, the correctness of which was astonishing, but the nature and process of which I could not guess. As M. Niepce spoke much of the importance of his invention, I induced him to address a memoir on the subject to the Royal Society of London, of which I then was not yet a member. M. Niepce, in doing so, only alluded in general terms to his invention, but did not like at once to disclose the preparation of the plate, &c. On this ground the Council of the Royal Society took exception, and answered, that as there is a *secret* implied in the invention of M. Niepce, they could not take any cognizance of it. And there the matter ended!"—Now, it is easily to be understood that any respectable learned body could not well entertain any secret relating to the destruction of vermin, or a quack medicine; but why photography had to be comprehended in a similar ban, is difficult to guess. M. Niepce, therefore, left England. But I think that even Daguerre never questioned the priority or contemporaneity of M. Niepce's invention, who also, or his relicts, received some recompense from the French government. Such, however, were the reasons why photography (heliography) has become a French, and not an English invention. As the originals of the application to, and other correspondence of M. Niepce with the Royal Society of London, must be still in existence in Somerset-house, their publication will much interest the many admirers of heliography, the proportions of whose manifestations have now become gigantic. J. Lotsky.

HART'S APPARATUS FOR TILLING LAND BY STEAM.

The following is a description of the improvements in portable steam engines and apparatus connected therewith for tilling and cultivating land, for which provisional protection was obtained in January last by Mr. Charles Hart, of Wantage, Berkshire, and to which Mr. Baddeley directed the attention of our readers, in our Number for April 5, of this year, No. 1704.

These improvements relate—Firstly, to the construction and arrangement of portable and locomotive steam engines, adapted more particularly for agricultural purposes. A steam boiler of a convenient form is mounted upon a pair of travelling and driving wheels, with a guide wheel or wheels in front. Upon the boiler is placed a steam cylinder, a connecting rod from the piston of which gives motion to a horizontal crank *shaft, having at one end a fly*-wheel, and at the other end a bevel wheel, working into a second bevel wheel or wheels on the top of a vertical shaft. Upon this vertical shaft, which is called the worm shaft, there is an endless screw or worm that takes into a worm wheel on a second horizontal shaft, at each end of which there is a pinion. The inner edge of the tyre or rim of the travelling or driving wheel is furnished with teeth like a crown wheel, and the two pinions above named are so placed within the toothed edge as to work into the latter, and cause the wheels to revolve and propel the engine along the ground. In order to facilitate the travelling upon soft land, the inventor uses a circular endless rail, wider and larger in diameter than the rim of the travelling wheels, fitted with suitable guides for keeping it in its proper position around the travelling wheels.

The second part of the improvement consists in connecting with the portable locomotive engine apparatus suitable for tilling and cultivating land. For this purpose, at the hinder part of the machine, is placed near to the surface of the ground, an adjustable horizontal shaft or axis equipped with a number of tines or cultivators for breaking up the land. At the lower end of the vertical worm shaft there is a worm or screw, which takes into a worm wheel on the axis of the tines or cultivators, and communicates a rotary motion thereto. So that when the steam engine is set in motion with the cultivators properly adjusted, it travels over the land, the surface of which is ploughed up, broken, or comminuted, by the rotary action of the revolving tines or cultivators, and thereby prepared for the reception of seeds, &c.

INDIAN-RUBBER (CAOUTCHOUC) AND ITS ADULTERATIONS.

To the Editor of the Mechanics' Magazine.

Sir,—In a former paper, bearing date July 26th, I took the liberty of stating, in reference to the above heading, and upon which the public appear to know very little, that genuine Indian-rubber goods should always float on water, because the specific gravity was less than that fluid, and that just in proportion as it did not, was the per centage of adulteration with cheap powders. It is a very simple and effective one for engineers, proving how far the rail-springs, washers, &c., are made from the veritable gum or not; and, as they are much interested in the matter, I cannot press it too much upon their careful attention.

I then named some of the cheap articles largely used to deteriorate this new and useful appliance, and that the adulteration with them amounted to from 30 to 100 per cent., and more especially by those manufacturers

who sell what they term the "American Inodorous Goods," and that, in my next paper, I would furnish the forms in use for these goods now in the market, and thus redeem and prove the position I took in my first paper.

Agreeable thereto I now supply the cost to manufacturers, and their charge to engineers, &c., and shall be able fully to support by experience any exception taken therefrom:—

FORM I.

Black rail-spring, washers, &c. (as usually seen)—

		£	s.	d.
Grind	30 lbs. Java Indian-rubber, at 7d.	0	17	6
,,	14 lbs. common chalk, at 1s. 6d. per cwt.	0	0	3
,,	14 lbs. dry white-lead, at 3d.	0	3	6
,,	2 lbs. lamp-black, at 1½d.	0	0	3
,,	27 ozs. yellow sulphur, at 1½d.	0	0	3
	61 lbs. full, for	£1	1	9
	Mill-costs, at 3d. per lb., is	0	15	3
		£1	17	0

=5½d. per lb. cost to manufacturer.

These are made in moulds, about 26 inches in length, and cut to size required. They are sold at 2s. or 1s. 8d. per lb., and subject to from 10 to 25 per cent. discount or net, according to the shrewdness of the buyer.

Sometimes 6 lbs. of red lead is substituted for a like weight of white lead, *and is probably a good alteration*, but the cost is the same. I know a large gentlemanly buyer (to the extent of many thousands of pounds sterling annually) who has this addition (with just a dash of Para-rubber for the manufacturers to swear by), who pays 2s. per lb., and 10 per cent. discount.

FORM II.

Best black packing for large valves, &c. (called best pure packing), and sold at 3s. per lb., with discount of from 10 to 20 per cent.)—

		£	s.	d.
Grind	20 lbs. Para Indian-rubber, at 2s.	2	0	0
,,	10 lbs. (or more now and less of the best) of Java-rubber, at 7d.	0	5	10
,,	6 lbs. ivory and lamp-black, at 1d.	0	0	6
,,	22 lbs. red lead, at 3d.	0	5	6
,,	28 ozs. of yellow sulphur	0	0	3
	Mill-costs (average) 3d. per lb., is	0	15	0
	60 lbs., or 1s. 1½d. per lb.,	£3	7	1

These are the two kinds of vulcanized or mineralized black goods usually sold and in use, and a very extensive business is done, forming the main feature in the return of those manufacturers who work the American system.

I submit, the profits are very great, and the adulteration monstrous; and the subject needs careful weighing with large consumers.

In the list of forms from which goods are daily manufactured, I shall show that even greater adulteration is carried on; and, with your permission, and space in your valuable journal, I will hand you weekly papers, with the compounds now in use, until the list, *so far as the* WRITER'S KNOWLEDGE EXISTS, *is expended*. I trust it may be the means of stirring up all consumers of Indian-rubber manufactures to a just appreciation of the greater durability and usefulness of the articles (necessarily of light density) made from the pure gum; as it is these highly-adulterated articles necessarily of great density and rottenness, produced from the system, it is my wish to lay bare and throw daylight upon.

Many of your readers will know that the sulphur contained in the formulas *is the vulcanizing power*, and that, when in combination with ANY *preparation of lead, it blackens by heat*. I am, Sir, yours, &c.,

W. H. HERBERT.

Mitcham Common, Sept. 1, 1856.

ON THE CONSTRUCTION OF ARCHES.

To the Editor of the Mechanics' Magazine.

SIR,—A letter appears again in your columns of to-day, from "F. P.," which, I think, requires an answer.

Now, in the first place, he says, referring to my article, in No. 1722, "it is a mistake to expect any resistance from such an arch in the event of a pressure of water beneath," without giving any proof for what he says. It is true, he asserts that "the joints of the stones on each side of the key-stone would break," &c., but I can contradict this, and what is more, prove that I am right in so doing.

As I have before stated, the stones remain in equilibrium, which, of course, is the most advantageous position they can be placed in, when intended to resist thrust of any kind; also, each stone will withstand thrust in proportion to its strength; and the very fact that the arch can be sustained without the aid of mortar (whatever its shape) combined with what I have before stated, in my opinion undoubtedly proves the fallacy of your correspondent's argument. With respect to my mode of making the centre for such arches, I beg to deny its impracticability where there is much length of water-way, as this would make very little or no difference. As to the

striking of such a centre being attended with danger, I admit that it would require, perhaps, more than ordinary care; but it has the advantage of causing the arch to take a fixed, and definite shape, thus avoiding all sinking afterwards, which is very ruinous to the shape, and also to the strength of a good arch. I deny, likewise, that the plan of sliding the stones horizontally into their places, would answer, without very great care, (much more than would be required in the striking of a centre of my form,) because of the trouble of equally distributing the mortar, or rather keeping it from being rubbed off from parts when the key-stone is slid in.

And, to conclude, I consider that with tolerable accuracy (not more, however, than is used in the common arch) the mortar might be so placed, as to give to the arch a stability quite equal, and in all other respects far superior, to the ones of the common construction.

Hoping my friend, "F. P.," will be led by this to see his errors, and trusting for an insertion in your very useful Journal,

I am, Sir, yours, &c.,

J. A. D.

Reading, Sept. 13th, 1856.

THE MOON'S MOTION.

To the Editor of the Mechanics' Magazine.

SIR,—If we admit the principle on which Professor Airey, Dr. Lardner, and others ascribe rotation on its axis to the moon, it is a curious fact that the minute hand on the northern dial of a public clock turns round in reality but twenty-three times in twenty-four hours, and the hour hand only *once;* while the minute hand on the southern dial turns round twenty-five times, and the hour hand *three times* in the same period! I am, Sir, yours, &c.,

S. A. GOOD.

Pembroke Dock, Sept. 9th, 1856.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

HADDAN, J. C. *Improvements in omnibuses and other similar carriages.* Dated Jan. 21, 1856. (No. 157.)

This invention consists—1. In constructing carriages with their windows (or some of them) so disposed and arranged, that when closed they may be opened by sliding them upwards within or against recesses, or frames constructed in or fixed to the carriages, in order to receive them, and that when open they may be closed by sliding them downwards within or against such recesses or frames. 2. In constructing omnibuses with a portion of the floor inside of *the omnibus,* which is at or near the door, on a level or nearly so with the door step, and with the floor rising, either by a step or steps inside of the omnibus, or by a gradual inclination to the further end, or to some intermediate point.

POCKSON, J. *Improvements in the construction of roofing and other tiles.* Dated Jan. 21, 1856. (No. 159.)

This improvement consists in forming tiles in two distinct parts, one called the upper, the other the under tile. The under tiles are constructed so that when cut in cross section they present the form of a V; the upper tile is made in the same way, but is exactly the reverse when cut in cross section representing the form Λ. When in use the upper tile lies over and covers the junction of the adjacent sides of the two under tiles. They also have a projecting band on their under surface, to attach them to the tile lath.

BLITTKOWSKI, G. A. *Improvements in repeating fire-arms.* Dated Jan. 21, 1856. (No. 161.)

This invention relates to repeating fire-arms, and mainly consists in a method of working the revolving cylinder or breech chamber whereby the cartridge is deposited and rammed, the caps applied, and the charge conveyed to the gun barrel by the act of cocking; and in a method of arranging the lock whereby the several reciprocating and rotating motions of the breech-chamber, together with the operations of priming and firing, are produced.

TIEFFÉ-LACROIX, P. L. *Improvements in machinery for cutting files.* Dated Jan. 22, 1856. (No. 162.)

This machinery requires drawings to illustrate it.

THIERRY, J. B. P. A., jun., J. L. RICHARD, and BARON H. DE MARTINY. *Improvements in preventing smoke by means of a fumivore hygienic apparatus.* Dated Jan. 22, 1856. (No. 163.)

The improved apparatus consists of a spiral tube, which is partly carried through the furnace, in order that it may become highly heated. It conveys steam from the boiler or steam chest, which becomes heated, and is allowed to escape over the burning fuel through small apertures in the spiral tube, at the front part of the furnace, and also behind the bridge.

FONTAINEMOREAU, P. A. L. DE. *Certain improvements in machinery or apparatus for manufacturing nails.* (A communication.) Dated Jan. 22, 1856. (No. 166.)

This invention consists—1. In shaping or flattening the wire employed in the manufacture of nails, by means of an arrangement of counter pressure levers, which cause suitable steel dies to act upon the wire in opposite directions, in order to give to it the proper form. 2. Of improved means for

further shaping, heading, and cutting the nail, which cannot be described without illustrations.

LAWSON, E., and G. JENNINGS. *Improvements in reeling machines for winding flax, cotton, wool, and other yarns.* Dated Jan. 22, 1856. (No. 169.)

This invention has for its object improvements in reels of reeling machines to facilitate the removal of the yarns wound thereon. In constructing a reel the circular ring or frame at each end of it is composed of two parts, which together make up a complete circle, and one of which is centered upon the other, and falls in towards the axle at one end when the yarns are to be removed.

FRANCIS, J. *Improvements in the manufacture of metallic boats.* Dated Jan. 22, 1856. (No. 171.)

This invention was described and illustrated at page 193 of our number for Aug. 30, No. 1725.

HOOLE, H: E. *Improvements in stove grates.* Dated Jan. 22, 1856. (No. 173.)

This invention consists in the application of self-feeding stove grates, or grates having a fuel box fitted with a moveable plate or false bottom for supporting the fuel, and certain novel mechanism for raising and lowering the moveable plate; of a compound register for regulating the chimney draft; and in forming vertical grooves at the back of the fire place for conducting air to the fire and heating it in its passage upwards.

TOLHAUSEN, A. *An improved manufacture of yarn from wool or other felting material.* (A communication.) Dated Jan. 23, 1856. (No. 176.)

This invention consists in the manufacture of yarn from covings of wool or other suitable material by the felting process, instead of by twisting or spinning as formerly.

TOLHAUSEN, A. *An improved lock-joint for the rails of railways.* (A communication.) Dated Jan. 23, 1856. (No. 177.)

This invention consists in forming the joint of one section with another, the one against the other in a central, longitudinal, vertical plane, of any desired length, and extending only a portion of the height of the rail from the top to within a third of the base, more or less, when this is combined with the lapping of each section on and under the other in planes longitudinally parallel with the axis of the rail, and transversely inclined in opposite directions from the outside towards the central vertical oj division of the first named laps.

HOPKINSON, J., jun. *Improvements in apparatus connected with steam boilers.* Dated Jan. 23, 1856. (No. 181.)

The patentee claims—1. *Adapting* tubes of glass containing mercury between two flanges of a frame work, and forcing the lower end upwards, so that the upper end is caused to press against a washer of India-rubber or other elastic material. 2. Communicating the steam pressure to the surface of the mercury, by means of a steam pipe extending into a chamber filled with water or other fluid, whereby the same is caused to pass through an opening and effect the required object.

BARNES, I. *Improvements in the manufacture of knobs and furniture for doors, drawers, and other similar purposes, parts of which improvements are also applicable to the manufacture of cornice poles and other like articles.* Dated Jan. 23, 1856. (No. 183.)

The patentee takes a piece of glass and cleans it, after which he takes illuminated, printed, or embossed or coloured paper or cloth, and sticks it to the back of the glass by any transparent adhesive agent. In making cornice poles, &c., the ornamented paper or cloth is attached to the surface of a roller, which is afterwards fitted into a tube of clear glass, being secured in its place by a capping at either end. In making articles of door furniture, he takes a plate of glass and grinds the back of it to a dead surface. He then cuts upon the back any desired pattern, and leaves the cutting also dead, without polishing. This pattern may then be coloured according to design, or left without colour, and the whole back is then silvered.

NORRIS, S. *Improvements in the manufacture of boots and shoes and other coverings for the human feet.* Dated Jan. 23, 1856. (No. 185.)

These improvements consist in adapting to boots, shoes, &c., gussets of novel and improved construction, in combination with ordinary fastenings, for enabling boots, &c., to be readily adapted and secured to and detached from the feet, and at the same time preserved water-tight.

ROTHWELL, C. *Improvements in self-acting mules.* Dated Jan. 24, 1856. (No. 189.)

This invention consists of certain arrangements of mechanism, whereby the carriage is caused to move out at less speed, and the spindles to revolve at greater speed during the latter part than at the first part of the "stretch," by which means the required amount of twist is better put in the yarn or thread.

STRAFFORD, J. *Certain improvements in portable signal lamps, for railway, marine, and other purposes.* Dated Jan. 24, 1856. (No. 190.)

This invention comprises the application of coloured glasses to the outsides of lamps, and the application to hand or portable signal lamps of a circular shield for protecting and holding the signal glasses when

out of use, as also circular metal frames working on an axis, their attendant parts, and the particular shape and form of a certain oil reservoir and match drawer.

GIMSON, J. and G. *An improved apparatus applicable to steam pipes used for the purposes of heating and drying, which said apparatus may also be used for other similar purposes where steam is employed.* Dated Jan. 24, 1856. (No. 191.)

This apparatus is furnished with a valve for the discharge of air from such pipes, as well as with the ordinary means of retaining the steam, and of discharging the condensed water; such valve is also capable of being closed by the action of the steam alone. The air valve is situated in a steam chamber attached to steam pipes, and is so placed opposite the mouth of the air tube, that it will remain open, and allow of the escape of air through the ordinary discharge valve and outlet pipe, until it is closed by the pressure of steam which is directed against it for this purpose, by means of a small steam tube being extended from the inlet pipe in the steam chest or chamber attached to the steam pipes. The condensed water from the steam pipes falls into the steam cylinder and is discharged as required, by means of a ball and lever lifting and opening the discharge valve as in common use.

PETTIT, G. B., and H. F. SMITH. *Improvements in gas heating apparatus.* Dated Jan. 24, 1856. (No. 193.)

This invention relates to certain combinations of apparatus for obtaining heat from gas mixed with atmospheric air before ignition. It cannot be described in detail without reference to the drawings, which comprise nearly 150 figures.

FISHER, D. *Improvements in machinery for pressing, cutting, drying, and opening tobacco.* Dated Jan. 24, 1856. (No. 194.)

This invention consists in effecting, by mechanical means, the processes of pressing, cutting, drying, and opening tobacco, or other similar materials, so that they are effected consecutively either at one operation, or, if preferred, at two.

TOLHAUSEN, A. *An improved machine for boring and other cutting operations in stone and other mineral substances of similar character.* (A communication.) Dated Jan. 25, 1856. (No. 196.)

Claims.—1. The combination of a screwed socket and nut, or their equivalent, a base piece, and a collar or other suitable shoulder on the boring bar, whereby the power applied to the nut or equivalent to move the boring bar and feed the cutter to cut in an upward direction, or outwards from the inner extremity of the hole, and the resistance of the stone to the action of the cutter, are made to keep the bar and its appendages steady, and a cumbrous frame is rendered unnecessary. 2. The application of a cutter to the boring bar in such a manner that it may be drawn entirely into the bar. 3. Arranging the cutter to swing from a bearing within the boring bar, and to work through and slide upon a bearing in a slot in a rod which slides longitudinally through the boring bar, or what is equivalent, arranging it to swing from a bearing attached to a rod which slides longitudinally through the boring bar, and to work through and slide upon a bearing in a slot in the bar.

CHAUCHARD, F. *Improvements in the manufacture of paper and pasteboard from vegetable and wood substances.* Dated Jan. 25, 1856. (No. 197.)

This invention relates to certain processes for reducing into paste or pulp all sorts of wood or fibrous materials, in order to obtain paper and pasteboard therefrom. The inventor uses—1. A hacking machine for dividing and separating the ligneous filaments of the above-named plants. 2. Another apparatus, denominated a crushing machine, which is intended to separate and divide infinitesimally the fibres from each other, after the previous hacking or chopping operation.

SHANKS, A., and F. H. WENHAM. *Certain improvements in water gauges.* Dated Jan. 25, 1856. (No. 198.)

This invention consists in the application of a magnet loosely fitting a tube, and operating from the inside on a hoop outside, for the purpose of indicating the variations of water level in a boiler, cistern, or vessel.

KERSHAW, J. *Improvements in apparatus for preventing the explosion of steam boilers.* Dated Jan. 25, 1856. (No. 200.)

This invention consists of an improved combination of a float with a valve and whistle, or signal, whereby notice is given when the level of the water in a steam boiler is too low. Also, in the application of a collapse valve to boilers furnished with exploding plates.

BEADS, J. *Improvements in machinery or apparatus for spinning cotton, wool, or other fibrous substances where self-acting mules are used.* Dated Jan. 25, 1856. (No. 203.)

Instead of the two friction pulleys as used in Sharp and Roberts' self-acting mules to take out the different changes and put them in, the patentee produces a star wheel and partial star wheel, or a wheel with the spaces of the teeth, cogs, or rollers at different distances, to accommodate the different speeds at which the wheels may be required to revolve, or the changes required. Within the bosses of the wheels he places springs or packing, to soften the shock when the wheels come in contact. He also employs a double box to support or carry the end of

the escape lever, which box is packed with springs, &c., to deaden the shock, when the projections on the escape plate come in contact with the escape lever. He likewise employs a break which acts upon the backing off cone, being put in action by a cam or eccentric on the cam shaft, at the time that the driving strap is changing from the fast pulley on the rim shaft to the pulley connected with the backing off and putting up motion.

DALGETY, A. *Improvements in vices, or gripping or holding apparatus.* Dated Jan. 25, 1856. (No. 204.)

This invention consists in the application of a rolling gripping piece, fitted into one or both of the jaws of a vice, or other gripping or holding instrument, such rolling piece adjusting itself to the article or object to be gripped, whether tapered or parallel.

BROWN, G. *An improvement in the manufacture of cast steel.* Dated Jan. 25, 1856. (No. 205.)

The patentee puts into a common melting pot, charcoal bar iron, clipped in pieces of about 1½ in. long, and adds thereto good charcoal pig iron, in the proportion of one part, more or less, by weight, of pig iron, to three parts, more or less, of the clipper bar iron, and then melts the whole, and runs it into ingot moulds.

OWEN, W. *An improvement in pianofortes.* Dated Jan. 25, 1856. (No. 206.)

This invention consists in the employment in pianofortes of a second or supplementary sounding-board, and in fixing the bridge upon the second sounding-board, which is placed in front of the ordinary one, or in placing two or more sounding-boards behind the strings. The sounding-boards are connected to each other and to the bars. By means of the additional sounding-board or boards, the inventor produces, in an instrument of no greater height than three feet, quantity, quality, and tone of sound, equal to that produced from a first-class grand piano.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

BUCKLEY, J. *Improvements in looms for weaving.* Dated Jan. 18, 1856. (No. 146.)

This invention consists—1. In so arranging the parts of a loom that the reed, together with the shuttle race, shall move in upward and downward directions. The beating up may be effected either by the former or by the latter motion. 2. In arranging the loom to weave two or more pieces of cloth, the one facing the other, the reed and shuttle race being caused to move upward and downward, as described. Instead of employing one, the inventor contemplates using separate reeds for each, or for two or more pieces of cloth.

HEAVEN, A. and W. BOOTH. *Improvements in machinery for embroidering fabrics* Dated Jan. 19, 1856. (No. 147.)

These improvements consist in arranging the needles in curved, diagonal, or zig-zag lines, so as to produce a corresponding position in the designs embroidered on the fabrics.

ARMOUR, J. *Improvements in bleaching, washing, or cleansing textile fabrics and materials.* Dated Jan. 19, 1856. (No. 150.)

In modifying a common dash wheel, the inventor makes the circumferential portion of the wheel case or chamber double, or with a packet in the form of an annular casing. The axle or shaft of the wheel is made tubular for the purpose of admitting steam, hot air, or hot water through it, to the enveloping casing, so that the wheel may thus be kept constantly heated to a high temperature if necessary.

HORSFALL, T., and W. TURNBULL. *Improved machinery for breaking and preparing hemp, flax, and other similar vegetable fibres.* Dated Jan. 19, 1856. (No. 152.)

The inventors first expose the fibres to a breaking and splitting machine consisting of fluted rollers fitted in a frame in three or more tiers, horizontally or otherwise, the central rollers working in fixed bearings and driving the outer rollers. The machinery for further preparing the fibres consists of two endless bands, on which is fixed a series of scrapers driven by rollers and pullies.

AYCKBOURNE, F. *Improvements in the cleaning of knives and forks.* Dated Jan. 19, 1856. (No. 153.)

The inventor employs an ordinary lathe frame which supports a spindle, on which are placed sets of cylindrical drums or blocks, the periphery of each drum being covered with glue, size, or other suitable cement, on which is then fixed a piece of leather, so as to entirely encircle the drum. Such of these drums as are for cleaning steel knives and forks are then coated on the outer surface with thin glue, on which immediately afterwards fine emery powder is sprinkled. A sufficient number of grooves are then cut on the surface of the drums intended for fork-cleaning, whether steel or plated, to allow the fork to unbed itself, and putty powder is sprinkled over the other drums (which have not been coated with emery) in a dry state when in use.

HOUT, H. J. V. DEN, and E. BROWN. *Improvements in the preparation of pulp for the manufacture of paper, millboard, and other like purposes.* Dated Jan. 19, 1856. (No. 154.)

The inventors take curriers' shavings,

and wash them thoroughly to rid them of impurities, after which they are transferred to the ordinary pulping machine. They afterwards add from fifteen to sixty per cent. of any common pulp produced from rags, &c.

FENTON, S. *Certain improvements in locks and fastenings.* Dated Jan. 21, 1856. (No. 156.)

The inventor constructs a mortice lock, in which one bolt is made to serve all the purposes of the three bolts in the ordinary mortice lock.

GEDGE, J. *Improvements in the manufacture of boots or shoes.* (A communication.) Dated Jan. 21, 1856. (No. 158.)

The inventor proposes to form boots or shoes (half-boots principally) without seam, by cutting cloth into pieces, whipping these pieces together, and then placing them on a camber of the usual form. They are then flattened down, and a light coating of paste or size to give consistence is spread over; this done, another piece of cloth is added, and the sides are then sewn together. The outer stuff (leather or other) is then stretched over all, and nailed to the last: the whole is then sewn together in the manner clothes are sewn. This done, the boot is taken from the last, the sides remaining unsewn forming the eyelet parts, into which the eyelets for lacing are placed; it is afterwards treated in the ordinary manner, and forms a boot without a seam.

GEDGE, J. *Improvements in wrought iron wheels.* (A communication.) Dated Jan. 22, 1856. (No. 164.)

The inventor proposes to compose the box or nave of the wheel of a piece of iron prepared by a mould stamp acted upon by hammering. The mould is so formed that in the boss will be left a number of holes, equal to the number of spokes. The spokes are put each into its socket, and the felloe is then put on in circle in the usual manner. The wheel is now placed in the furnace, and when heated, a ring in the same state is placed in the boss where the spokes meet, and then the whole is welded by hammering.

GEDGE, J. *Improvements in bending, edging, and soldering tin.* (A communication.) Dated Jan. 22, 1856. (No. 165.)

The inventor proposes to employ, in order to bend or edge *large* sheets of tin, two wooden cylinders mounted horizontally, the one above the other, &c.

ROBERTSON, A. *A new manufacture of cases or canisters for dry goods, edibles, and such like commodities.* Dated Jan. 22, 1856. (No. 167.)

This invention consists in forming a cylinder of tinned iron, or other suitable metallic plate, as the body of the canister, and fitting to it a head, or top and bottom of *wood.*

HITT, T. *Certain arrangements of machinery for converting reciprocating into rotary motion.* Dated Jan. 22, 1856. (No. 168.)

This invention consists in connecting to a shaft supported in suitable bearings two segmental plates; in communicating to and fro motion to these plates; in fixing pauls on the inside of each plate in a reverse direction, and in causing the pauls of one segmental plate on the stroke in one direction, and the pauls on the other segmental plate on the stroke in the other direction, to gear into and drive a ratchet wheel placed between the two segmental plates. This ratchet wheel has thus a rotary motion communicated to it. It is toothed all round its periphery, and through a train of wheels may be made to communicate rotary motion.

BEECH, J. and E. JEFFREYS. *Improvements in the means of supporting the rails of railways.* Dated Jan. 22, 1856. (No. 172.)

This invention consists in constructing railway chairs and sleepers of a cruciform or star shape, so as to obtain a considerable amount of bearing surface for the sleepers so arranged that it may be more effectually packed than other sleepers of large bearing surface.

ONIONS, J. *Improvements in the manufacture of iron.* Dated Jan. 23, 1856. (No. 174.)

The inventor proposes to apply at the blast or other furnace, the smoke, heated air, and inflammable gases produced from fires, so that they shall be consumed in passing through the fused mass of ore or iron in the said furnace.

HOLCROFT, G. and J. PEACOCK. *Improvements in casings for fencing horizontal shafts.* Dated Jan. 23, 1856. (No. 175.)

This invention consists in fencing shafts by means of tubular casings supported by the shaft itself. These cases have suitable flanges or guards to prevent the strap from coming in contact with the pulleys on the shaft, and are kept from revolving with the shaft by a preponderance of a weight on the underside of the casings. The casings and guards are carried by suitable bearings at each extremity resting on the shaft, thereby preventing the accumulation of fly or other inflammable material within the casings.

JOHNSON, W. *Improvements in the treatment and application of fatty, resinous, and gummy substances, and in the manufacture of pastes, greases, and soaps.* (A communication.) Dated Jan. 23, 1856. (No. 178.)

This invention mainly relates to the decolorisation of resins, fats, and oils, which is to be effected by a process patented by the patentee for bleaching vegetable fibres by alternations or changes of temperature.

LLOYD, E. *Improvements in valves, and*

in the valve-gear of locomotive and other steam engines. Dated Jan. 23, 1856. (No. 179.)

This invention relates, 1, to steam-engines in which a variable expansive working of the steam, and a frequent reversal of the motion is required, and refers in the first place to an improved arrangement of mechanism whereby a varied extent of travel can be given to the valve, and a reversal of its action produced when necessary. The mechanism may be described as a T or quadrant lever, that arm which is perpendicular to the other two being connected with a single crank or eccentric fixed on the crank or other corresponding shaft of the engine, the fulcrum of the T lever being arranged so that it will be free to the reciprocating movements given to it in a direct line by the crank or eccentric. The invention relates, 2, to a valve or valves, which may be used in combination with the above improved valve-gear, the object being, by an addition to the single valve, to extend the duration of the expansion and exhaust, and thus diminish the compression.

MEYER, J. J. M. *An improved mode of manufacturing bank notes, cheques, and other like documents.* Dated Jan. 23, 1856. (No. 180.)

The inventor proposes to manufacture cheques, bank notes, &c., by a process of double printing, one to produce a plain tint or ornamental device of so elaborate a nature as to present the appearance of a tint upon the face of the paper, and the second printing to give the paper its peculiar designation.

TURNER, A. *Improvements in the manufacture of elastic fabrics.* Dated Jan. 23, 1856. (No. 182.)

The elastic fabrics named here are those narrow fabrics which are attached to the ends of gloves or stockings, and are composed principally of strands of India-rubber, bound together with a weft of some non-elastic material. The improvements consist in making a kind of double selvage on one side of this kind of fabric, so that the elastic fabric may be more easily placed upon the knitting machine, and will, when made up with the glove, lie flat.

NEWMAN, J. and W. WHITTLE. *Improvements in the manufacture of shafting for mill and engine purposes, which improvements are also applicable to the manufacture of shafts, poles, beams, masts, spars, and other similar articles, in which great strength or lightness, or both these qualities combined, may be requisite.* Dated Jan. 23, 1856. (No. 184.)

These improvements consist in manufacturing the articles above named in manner similar to that practised in carrying out an invention for "Improvements in the manufacture of axles," for which a patent, dated 16th July, 1855, was granted to the patentees, by making them tubular, and strengthening them in the inside with a bar running the whole length in a diametrical or radial direction in the cross section.

RICHOUX, L. A. R. *Improvements in clock works.* Dated Jan. 24, 1856. (No. 186.)

The object in these improvements in the mechanism of clocks or time pieces is to cause them to repeat the hour immediately after striking the half-hour, so that the hearers may know the particular half-hour struck.

SAMAIN, P. *An improved levelling instrument.* Dated Jan. 24, 1856. (No. 187.)

This improved levelling instrument, which is called a "Clitometer," is to be used by the surveyor in the operation of levelling. It cannot be described without illustrations.

SOLMONS, J. and E. LANDER. *A new or improved cigar holder.* Dated Jan. 24, 1856. (No. 188.)

The inventors make a foot or stand of any suitable substance, and attach to it a small tube-like vessel, open at top and closed at bottom. In the side of the vessel is an opening, to which is attached one end of a flexible tube, the other end carrying a mouthpiece.

JOHNSON, J. H. *Improvements in air beds, mattresses, and cushions.* (A communication.) Dated Jan. 24, 1856. (No. 192.)

These improvements consist in uniting the upper and under end of air beds, and other similar articles, by means of short lengths of chains or cords, connected at each end either to a nut or to a screw, with which they are secured to the impermeable material.

LONGRIDGE, J. A. *Improvements in the construction of ordnance and other vessels intended to resist internal pressure, and in the manufacture and method of discharging projectiles.* Dated Jan. 24, 1856. (No. 195.)

This invention refers first to that particular form of gun or cylinder formed by metallic wires coiled upon cores or cylinders in one or more parts, and consists in a particular method of laying on the successive coils of wire, in such manner that the tension or strain upon each coil, when laid on, shall increase in a certain definite relation with the distance of the coil from the centre of the gun or vessel. 2. It refers to a method of attaching the trunnions to the piece of ordnance, so that the recoil is transmitted through an elastic substance to the trunnions. 3. To a method of fixing the trunnions by means of a wrought iron or steel strap or bridle. 4. To the applica-

tion of an elastic substance within the barrel behind the charge. 6. To an arrangement whereby, after a piece of ordnance or gun is loaded, a state of rarefaction of the air in the barrel between the charge and the muzzle is produced, to diminish the resistance to the motion of the projectile. The improvements in projectiles consist in discharging rockets from guns or mortars made as before described by a separate charge of powder, and so constructing the rocket that its own combustion shall only come into action as a propelling force when the rocket shall have proceeded some considerable distance.

WOODWARD, G. G. *Improvements in the manufacture of carpets.* Dated Jan. 25, 1856. (No. 201.)

These improvements consist,—1. In extending the application of a patent granted to the inventor, dated Oct. 26th, 1854. He applies the combination of self and parti-coloured warps to the manufacture of carpets known by the names of Kidderminster, Scotch, and Dutch carpeting. 2. In working the self and parti-coloured warps in the same reed of the slay as in the manufacture of Brussels carpets, and working above and below each other, as the pattern may require. 3. In further improvements upon the methods of dyeing parti-coloured warps described in the specification above referred to, and in the apparatus connected therewith.

PROVISIONAL PROTECTIONS.

Dated June 9, 1856.

1371. William Smith, of Hastings, Sussex, chemist. A material for the destruction of flies, gnats, and other insects. A communication.

Dated July 16, 1856.

1675. David Bowlas, of Reddish, Lancaster, manufacturer. Improvements in "throstles," and doubling frames for spinning and doubling cotton and other fibrous materials.

Dated July 25, 1856.

1765. George Spencer, of Cannon-street West, London, railway spring manufacturer. Improvements in the couplings of feed pipes of locomotive steam engines and tenders. A communication.

Dated August 21, 1856.

1951. Joseph Hacking, of Clitheroe, Lancaster, cotton manufacturer, and William Wheeler, of the same place, gentleman. Improvements in the mode or method of winding, warping, sizing and beaming cotton, woollen, linen, or other yarns or threads, and in the machinery or apparatus employed therein.

1953. William Akroyd and John Thompson, both of Halifax, York, carpet-weavers. The manufacture of carpets or other fabrics.

1955. Thomas York, of Wolverhampton, Stafford, engineer. A new or improved safety valve *and low water* indicator for steam boilers.

1957. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improvements in pumps for raising water. A communication from Monsieur Poujade, of Lyons.

Dated August 22, 1856.

1959. Thomas John Chipp and Richard Bitmead, of Soho, Middlesex. Improved apparatus for drilling and boring.

1961. Charles Durand Gardissal, of Bedford-street, Strand, London. A new or improved rotary engine. A communication.

1963. Samuel Jay and George Smith, both of Regent-street, Middlesex. Improvements in ornamenting or trimming articles of outer attire, such as dresses, mantles, bonnets, and the like.

Dated August 23, 1856.

1965. Philippe Benoist, of Rue de Lancry, Paris, France. An improvement in the construction of stereoscopes.

1967. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in stocking looms. A communication from J. N. Brocard, of Troyes, France.

1969. William Racster, of Francis-street, Woolwich. Improvements in apparatus for regulating the supply of gas.

1971. Alexander Moses, of Cannon-street-road East, Middlesex, brazier. Improved machinery for propelling vessels on water.

1973. James Wadsworth, of Hazelgrove, near Stockport, Chester, machine maker. Improvements in the ventilation of mines and in removing noxious gases or vapours from places in which they accumulate or are generated, and in machinery or apparatus applicable to and to be used for such purposes.

Dated August 25, 1856.

1975. Hugh Dickie, of Girvan, Ayr, N. B., engineer. Improvements in machinery or apparatus for cutting or shaping wood or other substances.

1977. William Webb, of Wilson-street, Middlesex, upholsterer. An improvement in reclining chairs.

1979. Thomas Marples, of Derby, mill-stone merchant. Improvements in corn mills.

1981. Henry Bessemer, of Queen-street-place, New Cannon-street, London. Improvements in the manufacture of iron and steel.

Dated August 26, 1856.

1983. John Perry, of Great Portland-street, Middlesex, artist. Improvements in photography.

1985. William Frederick Bush, of Bristol, millwright, and William Hewitt, of the same place, gentleman. Improvements in machinery or apparatus for grinding grain.

1987. Charles Carey, of the Parade, Harleyford-road, Vauxhall. Improvements in shower-baths.

1989. James, Earl of Caithness, of Barrogill Castle, Caithness, N. B. Improvements in cutting or shaping stone, and other substances.

1991. Richard Williams Vivian, of Camborne, Cornwall, assayer. Economising the consumption of fuel.

Dated August 27, 1856.

1997. Thomas Lees, of Stockport, Chester, machinist. Improvements in lubricating parts of steam engines, and in apparatus and machinery to be applied for that purpose.

1999. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improvement in projectiles for cannon. A communication.

2001. Israel Colbeck, of Batley, York, machine maker. Improvements in machinery for tearing rags, adapted particularly for shoddy or artificial wool.

Dated August 28, 1856.

2004. Charles Durand Gardissal, of Bedford-street, Strand, London. A new manufacture of artificial fuel. A communication.

2006. Bernard Augustus Grautoff and Charles Henry William Albrecht, both of Lime-street-square, London, merchants. Improvements in the construction of pressure and vacuum gauges. A communication.

2008. Cæsar Heilmann, of Milk-street, Cheapside, London, engineer. Improvements in furnaces of steam boilers.

Dated August 29, 1856.

2010. John Avery, of Essex-street, Strand, London. Improvements in bellows. A communication from Chardon and Co., of Lyons, France.

2012. John Randolph Sees, of New York, U. S., mechanical engineer. Improved apparatus for heating the feed water of steam boilers.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

2103. George Tomlinson Bousfield, of Sussex-place, Loughborough-road, Brixton, Surrey. An improvement in flying or roving frames. A communication. Dated September 9, 1856.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," September* 16*th*, 1856.)

1062. O. Blake. Improvements in applying practically the principle of internal reflection within transparent substances.

1072. R. Heaton, jun., H. Heaton, and G. Heaton. A new or improved manufacture of balance weights used for counterbalancing pendant lamps and chandeliers, and for other like purposes.

1079. A. E. Riddle and I. H. Boyd. Improvements in tanning by machinery and chemicals. A communication.

1089. A. V. Newton. An improvement in bands for securing bales of goods and for other like uses. A communication.

1090. S. W. Underhill. The preservation of life in cases of shipwreck or other casualty at sea—the buoyant cushion.

1095. F. Potts and T. Vann. Certain machinery for ornamenting, floating, burnishing, and polishing metallic tubes, part of which machinery is also applicable for performing the like operation upon other metallic surfaces.

1100. L. Beauché. A machine for the manufacture of cigars.

1133. H. Groves. Improvements in tune barrels or cylinders, or other apparatus for playing upon organs or other musical instruments.

1142. C. Gibson. Improved machinery for the manufacture of bricks, tiles, pipes, and other articles made of clay or plastic materials.

1169. A. V. Newton. Improvements in machinery for forging or pointing wrought nails, spikes, and other four-sided articles. A communication.

1185. J. Wilkes, T. Wilkes, and G. Wilkes. A new or improved manufacture of rollers or cylinders for printing fabrics.

1191. J. A. Gollop. An improved method of excluding dust, water, air, and other extraneous matters, from doors, windows, glass, show cases, and such like constructions.

1206. A. Allan and T. Hunt. Improvements in the construction of locomotive and other steam engines and carriages, and in the rolling stock of railways.

1221. W. C. Dempsey. A compound for removing all obstructions of the air passages.

1230. S. Berrisford and E. Wilkinson. Certain improvements in looms for weaving.

1255. C. Cowper. Improvements in the treatment of coal, and in the purification, desiccation, and agglomeration of coal, and in machinery and apparatus for such purposes. A communication.

1258. W. E. Newton. An improvement applicable to quadrants and other instruments for taking the altitude of the sun or other objects. A communication.

1286. F. A. Calvert. Improvements in machinery for opening, cleaning, and carding cotton and other fibrous materials.

1310. E. Marsden. Improvements in implements for pulverizing and cleaning land.

1338. J. Betts. Improvements in the preparation or manufacture of artificial spheres.

1361. A. Robertson. An improved ink-stand.

1368. J. H. Johnson. Improvements in the construction of rails for railways and in the mode of securing the ends of rails for railways. A communication.

1381. A. V. Newton. An improvement in projectiles for ordnance. A communication.

1411. P. A. Lecomte de Fontainemoreau. Certain improvements in metallic packing for stuffing-boxes and pistons. A communication.

1572. R. L. Howard. Improvements in valves for regulating the flow of fluids.

1644. A. N. Wornum. Improvements in grand pianofortes.

1680. C. Barlow. An improved surveying instrument. A communication.

1685. E. Seymour. Improvements in the construction of furnaces. A communication.

1744. W. Webster. Improvements in pumps. A communication.

1758. G. Collier, J. Crossley, and J. W. Crossley. Improvements in finishing and stretching woven fabrics.

1868. J. Woodman. An improved telegraph insulator.

1875. W. Webster. An improved valve cock. A communication.

1912. H. Dubs and J. Evans. Improvements in effecting the consumption of smoke.

1914. W. Hargreaves. Improvements in Collier's combing machine, in combing wool, hair, cotton, silk, flax, and other fibrous substances.

1924. W. Tytherleigh. A new or improved manufacture of rollers or cylinders for printing fabrics.

1928. J. Stopperton. Improvements in propelling vessels.

1938. H. Bessemer. Improvements in the manufacture of iron and steel.

1947. W. Gossage. Improvements in obtaining sulphur and metals from certain ores and other compounds of metals.

1958. G. J. Farmer. Improvements in machinery to be used in the manufacture of chains, links, buckles, buckle-slides, rings, and other similar articles.

1981. H. Bessemer. Improvements in the manufacture of iron and steel.

1989. James, Earl of Caithness. Improvements in cutting or shaping stone, and other substances.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1853.

2116. Henry Dubs.
2117. Adolphus Sington.
2118. Alexander Allan.
2135. Moses Poole.
2136. George Spencer.
2166. Christopher Nichels and Ralph Selby.
2331. James Hall Nalder and John Thomas Knapp.
2409. John Norton.

LIST OF SEALED PATENTS.

Sealed September 12, 1856.

1856.

602. William Bramwell Hayes.
627. James Rice and William Rice.
636. John Mitchell.
637. Thomas Palmer.
638. Robert Thomson.
655. John Davie Morries Stirling.
667. William Charles Theodore Schaeffer.
743. William Ward.
759. William Muschamp.
771. Charles Jean le Mélorel de la Haichois.
809. Frederick William Kitson.
839. Ephraim Morris.
871. George Jackson.
885. George Davies.
965. Thomas Jeacock.
1395. John Stenhouse.
1503. Henry Waller.
1533. Henry Brown and Job Bartlett.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine*, must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

J. A. D.—Your letters on Weighing-machines and Lunar Rotation have been intentionally passed over, as we do not think their publication would be of service.

Presbyter Claudicans.—We cannot give you the information required, but will insert your letter in our next, and may thus elicit it.

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LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, *Dublin*; *W. C.* Campbell and Co., Hamburg.

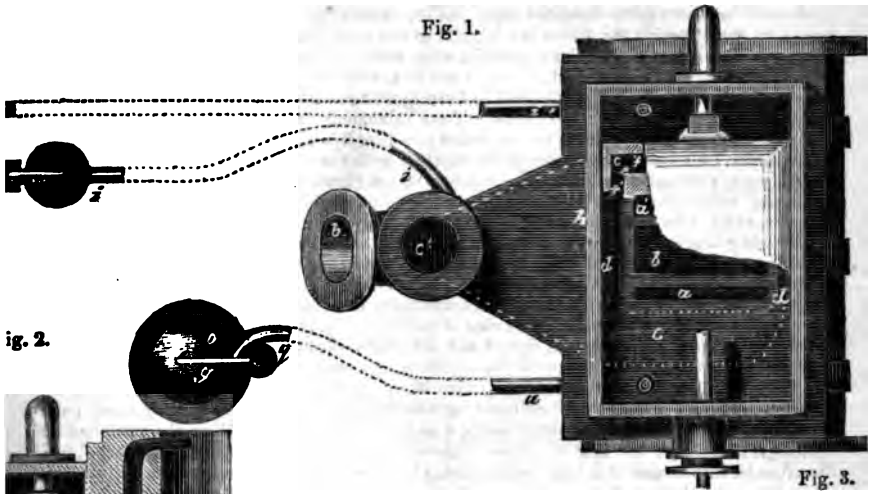
Mechanics' Magazine.

No. 1729.] SATURDAY, SEPTEMBER 27, 1856. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

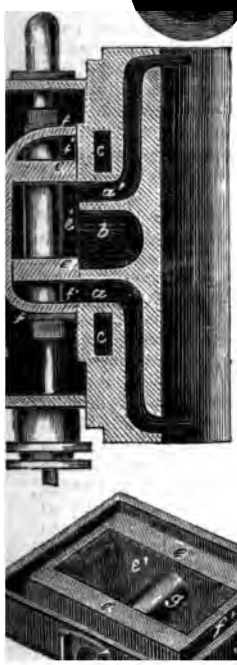
IMPROVED BALANCE SLIDE-VALVES.

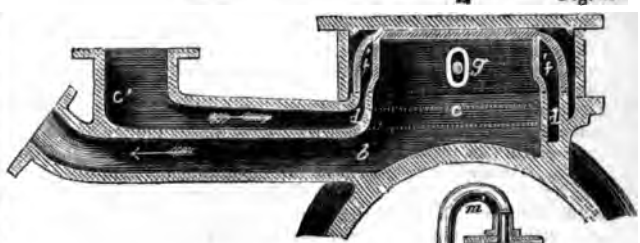
Fig. 1.

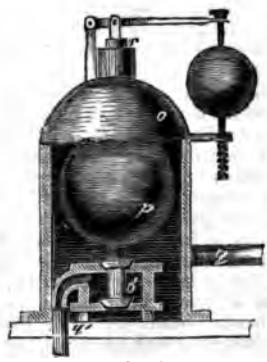


ig. 2.

Fig. 3.







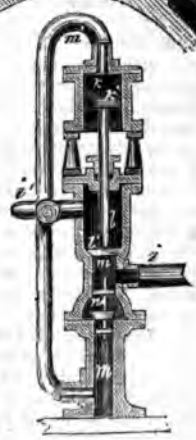


Fig. 4. Fig. 6. Fig. 5.

IMPROVED BALANCE SLIDE-VALVES.

An improved balance slide-valve, in which the pressure of steam on one side is neutralized by that on the opposite side, has been invented by an American gentleman, and patented in this country by Mr. R. A. Brooman, as a communication.

In the theoretical operation of a valve constructed according to this invention a perfect equilibrium is produced, but in practice it is required that there shall always be sufficient pressure upon the valve to keep it in its seat. Inasmuch also as the surface under the valve is much less than that above it, the pressure of the steam upon these must be different in the proportion of the areas exposed, in order to produce an equality; and to accomplish this, by steam taken from the same boiler, constitutes a material part of the invention. In the operation the steam is admitted to the ports from the under side, the exhaust being also from that side. Consequently, were nothing interposed to prevent, the valve would be forced up from its seat. To obviate this, steam pressure is applied to the opposite surface, and sufficiently in excess to keep down the valve. This is accomplished by self-regulating parts. The construction of the valve, and the manner in which the steam passes for working the engine, are as follows:—Fig. 2 is a sectional view of a portion of the cylinder, its steam and exhaust ports, together with the valve and the case enclosing it, which latter, although resembling the ordinary steam chest, is not strictly the same, as it is formed within the valve itself. *a a'* are the steam ports and channel-ways in the cylinder, and *b* is the exhaust passage. *c c* are steam-ways, cast in the metal of the cylinder, and running across the same, outside of and parallel with the two steam channels, *a a'*; to these, on one side of the cylinder, is attached the steam nozzle, *c'*, as shown in figs. 1 and 3, and they are also connected to two others, which form the outlets, as shown at *d*, figs. 1 and 3. The valve is of such shape as to cover these outlets, as well as the regular steam ports, *a*, and *a'*. Fig. 4 is a perspective view of the valve exhibiting its under side; in fig. 1 a portion of its top is shown, and figs. 2 and 3 show longitudinal and transverse sections. The parts, *e* and *e'*, form a valve of the ordinary construction, and this is enclosed by a cover, *f*, sufficiently large to leave a channel or space, *f'*, between. When the valve, therefore, is on its seat upon the cylinder, in whatever position it may be, this cover part, *f*, will always embrace the two steam ports, *a* and *a'*, at its end, as well as the two channel openings, *d d*, figs. 1 and 3, at the sides. The steam which passes through the pipe, *c'*, will therefore be discharged at *d* into the channel, *f'*, and will thence pass into the cylinder by the ports, *a* or *a'*, according to the position of the valve, as represented in fig. 2. The passage, *d*, is always open to *f'*, because the motion of the valve is in a direction parallel therewith, and thus the space *f'*, becomes in fact the steam chest. *g* is a tube cast in the valve to admit of the passage of a stem or rod, by which it receives its motion in the usual way.

It is apparent, from what has been set forth, that the valve would be blown upwards by the steam passing through *d*, with a force due to the pressure of the steam and the surface exposed to that pressure, which is the area of the channel, *f'*, and it will therefore require a like force applied to the top of the valve, to keep it in place. This is accomplished by the application of steam, and the valve is therefore enclosed in a steam-tight case, *h*, of sufficient strength to withstand the pressure. It will be seen that as the area exposed by the outside of the valve is very much greater than the area of the channel, *f'*, steam of less pressure will be required within the case, *h*, to overcome the power of that exerted in the channel, and the difference will be as the respective ratios of *f* and *f'*. To apply and maintain the steam in *h* at such relative pressure to that in *f'*, as will insure the full balancing of the valve, constitutes one of the important features of the present invention. Figs. 5 and 6 are views of apparatus connected with the operation of the valve. Fig. 5 shows the instrument for maintaining the proper pressure of steam in *h*, and fig. 6 shows an apparatus for discharging the water from the condensed steam in the case, *h*. The manner in which these are connected with the valve is shown in fig. 1. The steam from the boiler must pass through the regulator, fig. 5, in its way to the steam case, *h*, and the operation of the regulator is such as to allow only so much to pass as will accomplish the balancing of the valve. In this fig. the steam is represented as being taken out of the steam pipe, *c'*, leading to the engine, as at *i*, fig. 1; after passing through the regulator it flows into *h* by the pipe, *i'*. The regulator is constructed as follows:—*k*, fig. 5, is a cylinder fitted with a piston, *k'*, the rod of which passes downward thorough a stuffing box into another chamber, *l*, where it terminates with a valve, *l'*, fitting in an aperture leading to the chamber. Beneath the valve, *l'*, a pipe, *m*, continues downward some distance, out of which two pipes lead, the upper one being the pipe, *i*, before named. Out of the chamber, *l*, leads the pipe, *i'*, forming a continuation of *i*, and connecting with the steam case, *h*, as in fig. 1. The other pipe, *m*, commences from near the bottom, and turning upward intersects the pipe, *i'*, and termi-

nates at its other end in the cylinder, *k*. Between *i* and *m'* is a valve, *n*, opening upwards, as shown. The apparatus shown in fig. 6 is constructed as follows:—*o* is a water-tight vessel, in the bottom of which is a balance valve, *o'*, to the stem of which valve is attached a float, *p*. *q* is a pipe leading from *o* to the steam case, *h*, fig. 1; *q'* is a discharge pipe, and *r* is a safety valve of the ordinary construction. The operation is as follows:—The valve, *f*, is worked in the ordinary vibrating manner; steam entering through *c'*, flows on into the channel, *f'*, as before set forth, whence it passes into the ports, *a* or *a'*, according to the position of the valve, the exhaust, through *b*, being of the usual description. Steam will also flow through the pipe, *i*, into *m*, whence it escapes by raising the valve, *l*, and thence passes into the steam case, *h*, through *i'*. Unless means were taken to prevent it, the pressure in the case, *h*, would soon be equal to that in *f'*; and as the outer surface of the valve exposed to the pressure of the steam is much greater than that on the under side, it would be forced down upon its seat, and would in consequence require considerable power to move it.

To balance the great pressure of the direct steam beneath in *f'*, much less is required in *h*. This is obtained by shutting off the flow of steam through *i'* as soon as enough has entered into the case, *h*, to accomplish the object; and this is effected by means of the piston, *k'*, fig. 5, where it will be seen that a branch pipe, *m'*, leads a portion of the steam off from *i'* into the cylinder, *k*, and acting on the piston, *k'*, forces down the valve, *l'*, and stops the further influx of steam through *i*. But unless the area of the piston, *k'*, were greater than that of the valve, *l'*, no such effect would take place. And this is precisely the condition of the two: for the areas of the piston, *k'*, and valve, *l'*, are to each other as the respective areas of the outside of the valve, *f*, and of the channel, *f'*, so that the low-pressure of the steam in *i'*, or, what is the same thing, in the case, *h*, is sufficiently powerful to force down the valve, *l'*, against the greater pressure of the steam in *i*. The moment, therefore, that the steam in *h* gets below the requisite pressure to maintain the valve in its seat, the equilibrium between *l'* and *k'* is destroyed, and *l'* is raised, whereby more steam enters. In practice, as the steam in *h* must be all the time condensing, and therefore diminishing in volume, the valve, *l*, will be always raised just so high as to permit the requisite flow of steam to supply this source of waste, and maintain the equilibrium of the valve.

The piston, *k'*, and valve, *l'*, have been described as having the same relative difference in area that the two steam surfaces of the main valve have. In theory this would be correct, but in practice it will be well to have a slight pressure upon the valve, in order to insure its fitting closely to its seat; the piston, *k'*, will therefore be less proportionately in area to that of the valve, *l'*, than the proportion the inner side of the slide valve bears to the outer, and thus a greater pressure of steam will be required to force down the valve, *l'*, than would be required to balance the steam on the under side of the main valve. Hence it would be worked under a pressure proportioned to that difference, which difference may be whatever in practice will be found most advantageous. The use of the valve, *n*, is to permit the steam to flow back into *i*, in case from any cause there should be an excess of pressure in *h*, which would thus be relieved.

As the water from the condensed steam accumulates in *h*, it must be removed. This may be done by a cock attached to *q*, which is opened so far as to allow of a slight continuous flow-off, or otherwise by means of the apparatus shown in fig. 6. As the water rises it flows through the pipe, *q*, into the chamber, *o*, and, as soon as it has filled it sufficiently to raise the float, *p*, the valve, *o'*, will be lifted, and the water discharged as shown, no steam escaping thereby.

THE VULCANIZATION OF INDIA-RUBBER.—NO. III.

"We have attempted to show that, amongst the number of advantages claimed for the hard vulcanized India-rubber, is that of the power of closely imitating almost any article, substance, or material. In doing this we ought to have referred to the Vulcanite Court of the Crystal Palace for a full corroboration of the position we desired to assume. We are now about to advance a step further, and shall put forward proofs that hard India-rubber, submitted to a certain facile process, not only has a right to be placed side by side with almost all and every material it affects to imitate, but has a further right to be considered as superior. Of course, there are exceptionable cases to this, as in all rules, and these will be pointed out during this attempt to give a thought-bearing digest of the present position of this discovery.

The material produced by vulcanization being as hard as, and capable of a greater amount of wear than iron, brass, and, in many cases, even than steel, we have the element of durability to start with. And it must be recollected that this wonderful power of resisting wear, both from friction and the action of the atmosphere, is endowed

by a process as facile as that possessed by the baker of ship biscuits. That, while the mass or dough is in its soft state, it falls into, and, as it were, courts the required form of its future existence with a fluency possessed by scarcely any other material. Designs of the most exquisite kind, or of the simplest character, may thus be turned out like tea-cakes, and, like tea-cakes, carried to the vulcanizing oven. But here the simile stops; for these biscuits of Mr. Goodyear defy the teeth of time and the digestion of ages. There are manufacturers, however, that cry out, "We don't want articles which will last." This is a narrow view of things. Experience is opposed to so ungenerous a sentiment. A moment's thought would for ever dispel the illusion. Is there any less demand for iron furniture or iron household utensils because such articles in that metal will last longer than others? Or is the diamond less prized because it is nearly indestructible? The family of mankind, ever growing and increasing, with its varied wants, its constant changes of fortune and alterations in its tastes, its coquetry and its caprice, will find for the industry of the world quite enough to keep it employed. With the introduction of machinery there was to have been a less demand for "hands." With the introduction of railways, horses were literally to go to the dogs. Need instances be multiplied? Perhaps it were better to do so while such a feeling is in the ascendant; but space is imperative, although prejudice is stubborn.

We have taken the button as a familiar instance of the power of the vulcanite *en masse* to come into competitive economic rivalry with every class of that useful article. It has done so in America; it is doing so in France and in Belgium.

Even the pressed hoof or bone-button manufacture, it is said, will not be able to stand against the introduction of the vulcanite. Granted that ox-hoof is cheaper than vulcanite—that the manufacturer gets it for nothing (and the same argument will apply to the commonest wood furniture, handles of knives, jewellery, and a host of other things), what does he make with it? Why, an article which possesses neither durability nor strength, and which is impressed with a face of unmistakable vulgarity. In lieu of this, buttons are equally rapidly made, with any impress, however beautiful, from their plainness or ornamentation, with a permanent polish, if necessary, and possessing the strength, and, if desired, the character of bronze or other metals. We have taken the button more than once as an illustration, because it appeals to the comprehension of most; but the same general features of manipulation and durability apply to all other things having for their basis the vulcanized gum elastic. We will go further, and while admitting, for the sake of example, that the mass or dough may or may not be cheaper than oak or rosewood in bulk; but when one article in either of these woods is required for furniture, &c., which shall possess finish by polish or decoration by the hand of the skilled artizan, these woods, cheap as they may be, are immeasurably distanced. Indeed, if the labour of production is taken into consideration, the cost is less for the finest examples of vulcanite imitations of the most expensive woods, than would be any article of the same description made in deal.

"But," very naturally observes the reader who has possessed himself of some one or more of the specimens from the Crystal Palace, "this quality of cheapness is a myth. I for one have put it to the test, and this stick, for instance, cost me 5s., or this pencil 2s." Now, in the first place, the stick or the pencil should be compared with any other sticks or pencils possessing all the recommendations of those in question to arrive at a fair appreciation; and in the next, it should be remembered that those examples are produced from abroad. They bear a duty, and, in many cases, they proceed from small and experimental operations. We have made especial inquiries into these facts, and find that such is the case, and that such circumstances are no more than reasonable, as appertaining to every invention upon its first introduction. The Daguerreotype is a case in point. The inventor, and all those concerned in placing the discovery before the public, take care that the prices shall be kept so that a remuneration shall be obtained before it is let down to the bare cost of production, added, it may be, to the interest upon capital employed.

The mass, in its soft stage, does its own work. That is to say, a sheet of it may be laid over a mould, and the bare weight of a shovel full of sand cast upon it, will press it into every lineament of the matrix. This sheet of the soft material may have for its components a large proportion of oxide or of sawdust, as the desire may be either an imitation of bronze or of some particular wood or other material.

The extraordinary toughness of the veneers prepared for the covering of furniture, however simple in form or ornate in design, is no less remarkable. The exquisite beauty of the slightly-relieved patterns upon some of this veneer ought not solely to weigh in its recommendation, inasmuch as, in the act of rolling or pressing the material into veneer, the process adopted may either involve, as will now be obvious, the most

finished and intricate designs, or simply a plain surface. The boy, while playing with a piece of putty, stamps with like facility the impress of a perfectly smooth button in it, or the elaboration of one owing its origin to the art and genius of a Halladay or a Wyon. There is an additional feature in this method of rolling or pressing these veneers and the material itself; although there is no more labour expended in making miles of veneer, covered with the most attractive arabesques, than in making "parliament" or "hardbake," a perfect and indelible polish is simultaneously obtained in those parts where it is required to give relief to the rest. In a word, finish is consequent upon the act of making the veneer, and the act of pressing or rolling the material into veneer is the ultimate act of its finish. But what is, perhaps, the most surprising fact to those not familiarly acquainted with the nature of the material, is, to see done, or to take themselves a hammer, and strike the delicate tracery of the vulcanized surface in right earnest, without making the slightest impression upon it, or effacing its polish in the least.

This power of resisting percussion deserves a chapter in itself, and we may one day return to the subject, as it involves principles which may be brought to bear in a variety of directions which we at present scarcely dream of. We are tempted, however, to give one instance. The handles of knives, cornices, brackets, and other articles in vulcanite which are electro-plated, may be struck a very severe blow with the hammer—a blow, indeed, which would leave its mark to some depth upon gold in the solid—without the merest perceptible indentation. This, doubtless, arises from the slightly-yielding nature of the vulcanite beneath the surface of the gold or other coating of ore, which, returning after percussion, restores the latter to its original form. Other reasons are assigned for this protecting influence, but we at present consider our own to be the common-sense view of the matter, and that it neither stands in need of technical or abstruse reasoning nor mystical philosophical explanation.

It will be seen that furniture, for instance, veneered with vulcanite, may be made to assume at once both finish and perfection of character, with an amount of labour scarcely appreciable. The facility with which this veneering may be effected upon any kind of woods is perfectly startling. The cabinet-maker has but to steep the veneer for a few minutes in boiling water, and a sheet of it becomes as tractable as moist paper. Thus he may veneer round and over the sharpest curves and angles, and cover a surface with the ease of the paper-hanger. The angles may be as that of a razor-blade, and the task is done with equal certainty and permanence. With all these ductile capabilities, it may be cut with a pair of scissors, and the edges, being as smooth as glass, may be brought together with an almost imperceptible junction.

It is from veneer of this kind that pen-nibs, in imitation of quill, are made. It may be, however, that the sheets in imitation of the steel for pens are somewhat more in accordance with the peculiarities of that metal than those for furniture; but the allusion to the nature of the stuff is sufficiently close for our present purpose.

The imitation quill pens are made in length to any extent. The tubes are of various diameters, and the thickness varies according to the description of pen to be fabricated. We have seen some of these barrels or tubes cut into lengths of six and nine inches, thus serving for pen and penholder at the same time. The material thus prepared can be cut with the ordinary penknife with the same ease and to the evenness of quill. There is some little difficulty, however, in giving it the split with the penknife, although the machine used for pen-making does this without trouble. There are quills, more particularly those boiled in oil and baked to a crispness, which will not split with the knife; and in this we have something to compare with what we have seen in vulcanite.

But it is urged, and with some degree of reason, that pens made of steel or vulcanite should be made so cheap that, when they require mending, they should be cast aside. The pen we have used throughout these articles, and for other purposes during the last three weeks, is made from a tube of vulcanite such as we have alluded to. It has been purposely employed for this duty, and it has and continues to perform its allotted task with the same comfort derivable from other and the best kinds of quill. It is but right to add, that we have heard complaints advanced against their use, the most important, and perhaps the only one worthy of consideration, being that some inks have, it is said, a detrimental action upon the sulphur in the vulcanite, the minute grains of which it disengages from the gum, and thus renders the nib rough and uneven. This has not been the case with our own. We have mended it but once, and have used it now continually from the period we possessed ourselves of it. Penholders of almost all descriptions are likewise made of this material.

ON INCONGRUOUS SOLUTIONS.

BY JAMES COCKLE, M.A., F.R.A.S., F.C.P.S., ETC.

(Continued from vol. lxii., p. 510.*)

The theoretic development of

$$(x-2p)\ (x-2q)=0$$

is $x^2-2(p+q)x+4(-1)^2pq=0$; and, if we transform the latter equation into another, of which the left hand side is

$$x^2-2(p+q)x+(-1)^2(p+q)^2$$

and the right

$$(-1)^2(p+q)^2-4(-1)^2pq,$$

the form of the result shows that $2p$ and $2q$ are, each of them, theoretic solutions of the given quadratic.

For, the latter expression is equivalent to

$$(-1)^2(p^2-2pq+q^2)$$

and, neither p^2 nor q^2 being peculiarly affected by $(-1)^2$, the quantity within the right hand brackets is ambiguous in meaning, and may represent either

$$(p-q)^2 \text{ or } (q-p)^2.$$

Hence, there being no sufficient reason for preferring one of these values to the other, the solutions

$$x=2p \text{ or } x=2q$$

are, either of them, in general admissible.

The case is different when the arithmetical *data* of a proposition conduct us to a relation such as

$$x^2-2ax=-b^2.$$

The form given to the square root of the completed square shows that the quantity added to the left hand side in the ordinary process of solution, is tacitly supposed to be of the form $(-a)^2$ or $(-1)^2a^2$. If the logical consequences of this supposition are followed out in determining the form of the square root on the right hand side, it might be well to inquire whether some restriction should not be imposed upon the sign of that on the left. That limitations are sometimes, at all events, entailed by the direct process upon the inverse one is easily seen. For instance, from

$$x=-1,$$

we cannot argue that

$$x^2=(-1)^2=1=(+1)^2$$

and, consequently, that

$$x=\sqrt{(+1)^2}=+1,$$

for we should be involved in the inconsistency

$$x=-1=+1, \text{ or } 2=0.$$

Let us call that root which is obtained by a strict adherence to the affections of the symbols the *theoretic* root. There are certain cases in which such a root seems to force itself upon our attention.

If A be greater than B, and

$$x^2-2Ax=\pm(-1)^2B^2,$$

then

$$x=A-\sqrt{A^2\pm B^2} \quad \ldots\ldots \quad (1)$$

gives the theoretic root.

Let

$$x^2+2Ax=\pm(+1)^2B^2,$$

then

$$x=-A+\sqrt{A^2\pm B^2} \quad \ldots\ldots \quad (2)$$

gives the theoretic root. And perhaps we should not be going too far if we called

$$x=A-\sqrt{A^2-B^2} \quad \ldots\ldots \quad (3)$$

the theoretic root of

$$x^2-2Ax=-B^2,$$

and

$$x=-A+\sqrt{A^2-B^2} \quad \ldots\ldots \quad (4)$$

that of

$$x^2+2Ax=-B^2,$$

whatever be the affection of B^2.

It must be remembered that A and B are always supposed to be (positive) *numbers*, related in the manner already mentioned. Their affections are to be determined by carefully watching the manner in which the *data* of a proposition generate the arithmetical quantities which enter into the final equation.

I do not mean to assert that the theoretic is invariably the *congruous* root. But I have already discussed various examples in a way which tends to show that, when the *data* and equations of a problem are free from radicals, the theoretic root has strong claims to such a character. To these examples I have given references elsewhere (vol. lxii., p. 510), and I hope that they who take an interest in the subject may be induced to consider them.

My present purpose is to illustrate the properties of the theoretic root by new examples, carefully excluding propositions the *data* or equations of which involve radicals,

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* The reader will be pleased to make the following corrections in p. 509 of my last paper (vol. lxii.):

Col. 1, note *, last line, *for* "vol. ii.," *read* vol. iii.

Col. 2, note †, line 5; substitute a *comma* for the *full stop*.

Mr. Wilkinson has since (vol. lxii., pp. 582—584), given an account of MM. Terquem and Gilain's views on Impossible Equations. A further discussion of the subject by Mr. Wilkinson, Mr. Crauford, and "Ergo" (vol. lxiii., pp. 392, 230, and 206), has since taken place. In a letter to me, dated March 25, 1851, and received about that time, Mr. Samuel Bills, of Hawton, communicated a result identical with one of those to which Mr. Wilkinson has been conducted (in vol. lvi., p. 464, paragraph "I.")

and which must be reserved for after discussion.

Example I. A vintner sold 7 dozen of sherry and 12 dozen of claret for £50, and finds that he has sold 3 dozen more of sherry for £10 than he has of claret for £6. Required the price of each. ("Young's Algebra," 4th ed., p. 148.)

Let x be the price of a dozen of sherry in pounds; then we shall find

$$292\,x - 21\,x^2 = 500$$

$$\text{or } (21\,x)^2 - 292\,(21\,x) = -500 \times 21$$

whence, by the formula (3),

$$21\,x = 146 - \sqrt{10816}$$

$$\text{or} \quad x = 2.$$

The other root is incongruous.

Ex. II. The plate of a looking-glass is 18 inches by 12, and it is to be surrounded by a plain frame of uniform width, and of surface equal to that of the glass. Required the width of the frame (J. R. Young, *ibid*, p. 150).

Let x be the width of the frame, then

$$(12 + x)(18 + x) - 18 \times 12 = 18 \times 12$$

$$\text{or,} \qquad x^2 + 30\,x = 216\,(+1)^2$$

whence, by the formula (2),

$$x = -15 + \sqrt{441} = 6,$$

the congruous solution (the value "3" in Young is an error).

Ex. III. A person bought a certain number of oxen for 80 guineas, and if he had bought 4 more for the same sum, they would have cost a guinea a piece less; required the number of oxen and the price of each ("Wood's Alg.," 10th ed., p. 86).

Let x be the number, then the conditions lead us to

$$x^2 + 4\,x = 320\,(+1)^2$$

whence, by the formula (2)

$$x = -2 + \sqrt{324} = 16,$$

the congruous result.

Ex. IV. A person bought a certain number of sheep for £72; and found that if he had bought six more for the same money, he would have paid £1 less for each: how many did he buy, and what did he pay for each? (J. R. Young, "Introduction to Algebra," p. 182).

Let x represent the number bought, then

$$x^2 + 6\,x = 432\,(+1)^2$$

is the strict expression of the equation to which the conditions conduct us; and the congruous solution, given by (2), is

$$x = -3 + \sqrt{441} = 18.$$

Ex. V. A horse-dealer bought a horse for a certain number of crowns, and sold it again for 119 crowns, by which means his profit was *as much per cent. as* the horse cost him; what was his first purchase? (Euler's "El. of Alg.," transl., 2nd ed., vol. i., p. 326).

This example falls under (2), which gives the congruous root. Questions 3, 7, 8 and 9 of Euler (*ibid*, pp. 325-331) fall under the same formula.

Ex. VI. Two merchants sell each a certain quantity of silk; the second sells 3 ells more than the first, and they received together 35 crowns. Now the first says to the second, "I should have got 24 crowns for your silk;" the other answers, "And I should have got for yours 12 crowns and a half." How many ells had each? (Euler, *ibid*, p. 331).

Suppose the first had x ells, then

$$x^2 - 20\,x = -75$$

and, by (3),

$$x = 10 - \sqrt{25} = 5.$$

This is the theoretic and congruous solution. But the other solution ($x = 15$) is also congruous.

Ex. VII. The difference of two numbers is 6; and if 47 be added to *twice the square of the lesser*, it will be equal to the *square of the greater*. What are the numbers? (Bridge's Alg., 6th ed., p. 99).

Let x be the lesser, then

$$x^2 - 12\,x = -11$$

and, by (3),

$$x = 6 - \sqrt{25} = 1$$

The greater number is, consequently, 7. These are the theoretic (and congruous) solutions, but those given by Bridge are congruous. In this respect the present resembles the last example, and also one which I have elsewhere given (vol. xlvi., p. 517).

In discussing an example taken from Kelland's Algebra, I have (vol. xlvii. p. 14) not done justice to the theoretic solution. The equation of the problem is

$$z^2 - \frac{185}{209}z = -\frac{24}{209},$$

whence, by (3),

$$z = \frac{185}{418} - \frac{119}{418} = \frac{66}{418} = \frac{3}{19};$$

hence,

$$x = \frac{19}{\sqrt{2}}, \text{ and } y = \frac{3}{\sqrt{2}}$$

These theoretic values are congruous, and their surd form does not, as it seems to me, affect the question, or mislead us in the application of our formulæ. Still, there are cases in which the "theoretic" interpretation is invalidated by considerations purely collateral, although neither this example nor the other taken (vol. xlvi. p. 516) from Kelland are among them. Thus, if

$$\left.\begin{aligned} x^3\,y - y &= 21 \\ x^2\,y - xy &= 6 \end{aligned}\right\}$$

(J. R. Young, Alg., 4th ed., p. 170), we find, on dividing the first equation by the second, and reducing, that

$$2x^2 - 5x = -2,$$

of which the theoretic solution is, by (3),

$$x = \frac{1}{2}.$$

The theoretic solution leads to a negative value of y ($y = -24$), the other to a positive one. But this circumstance appears to be accidental. We can scarcely expect the theoretic value to afford indications of extrinsic limitations which have entirely disappeared from the final equation of the problem, or to be controlled by the prospective conditions which an eliminated quantity may be called upon to fulfil. If the final equation be considered as a result of elimination, the number and variety of the conditions which may be supposed to have given rise to it is infinite, and to imagine that it can in every case be made to retain the impress of all would be to conceive it as endowed with contradictory properties. When, in the last instance, we eliminated the y by division, we utterly expunged it from the calculations. Neither the theoretic nor the other root had any relation whatever to it. And in its determination, we introduce an independent, extrinsic condition.

The theoretical solution is connected with the doctrine of "impossible" equations, on which subject I wish to add a few words here.

At page 39 of the *Philosophical Magazine* for January, 1849, I gave two expressions (W and X) which, as I then supposed, could not be made to vanish by any combination of symbols. Some time after, I suggested to the Rev. Robert Harley that the simpler one

$$x - a + \frac{a - a}{x - a}$$

was incapable of vanishing. In a letter to me, dated May 17, 1855, and which I received about the same time, Mr. Harley, with his usual acuteness and clearness of view, pointed out that the value

$$x = a \pm \sqrt{a - a}$$

would make the latter expression zero.

76, Cambridge-terrace, Hyde-park,
August 9, 1856.

MR. BESSEMER'S DISCOVERY.

THE two questions now under discussion in connection with this subject are, first, is the improvement in the manufacture of iron and steel, laid before the British Association by Mr. Bessemer, legally his? secondly, are the iron and steel produced by the improved process equal in quality to those manufactured in the ordinary manner?

In noticing these, we must first glance back at a few facts which were known to the world before the reading of Mr. Bessemer's paper, above alluded to. And in doing so we must make reference to inventions in which *steam* was employed as an agent for improving the manufacture of iron and steel, for both *air* and *steam* have been much written and spoken of in connection with the subject; and in an article in the *Birmingham Journal*, which excited considerable attention, the terms "air *and* steam," and "air *or* steam" were apparently used indiscriminately, and certainly to the confusion of the reader.

An invention, for which a patent was granted to Sir Josiah John Guest, Bart., of the Dowlais Works, and Thomas Evans, of the same place, is probably the oldest of those that bear upon the present subject. The patent was granted Sept. 28, 1840, for "Certain improvements in the manufacture of iron and other metals," and a description of the invention was given in this Magazine for Oct. 10, 1840. (See *Mech. Mag.*, vol. xxxiii., No. 896, p. 381.) The claim was there given as "the use or application of steam forced upon, *or into*, or in contact with the melted iron in the refining or puddling furnaces for the manufacturing of the same; ....." The methods of operation are also described.

The next invention that has been brought forward in the discussion upon Mr. Bessemer's improvement is one for which a patent was granted to Reuben Plant, of Holly Hall, July 18, 1849, for "Improvements in making bar or wrought iron." This invention was described and illustrated with engravings in this Magazine for Jan. 26, 1840. (See *Mech. Mag.*, vol. lii., No. 1381, p. 61.) According to Mr. Plant's invention, in a puddling furnace of ordinary dimensions there should be three lines of tuyeres across the top of the furnace, each line consisting of three tuyeres, and each tuyere being 1 inch in diameter; the line furthest from the chimney should be the tuyeres for the blast, and the other two lines the steam tuyeres for the puddling and preparatory chambers. The blast is to be at a pressure of 1 lb. and upwards to the sq. in., and the steam 10 lbs. and upwards on the sq. in. The blast should be intro-

duced at the top of the puddling chamber, just behind the fire bridge, in a slanting direction, so as to drive the flame, as it enters the puddling chamber, down upon the whole surface of the iron. The steam from the tuyeres should be introduced as nearly as possible at the same place, so as to fall in like manner at once upon the whole surface of the iron in the puddling chamber. It is stated that by means of the above arrangements the heat of the puddling and preparatory chambers can be regulated with great nicety without the employment of the damper usually inserted in the chimney of a puddling furnace. When the metal in the puddling chamber is melted, the blast is to be shut off, and steam introduced through the tuyeres until the iron boils. The steam is then to be turned off, and the blast is again brought into action till the iron appears above the cinder. The blast should now be shut off, and the iron finished by the ordinary draught in the usual manner, or the heat may be raised and lowered, as required, in the way above described. The damper over the fire bridge is to be raised and lowered from time to time, to increase or lower the heat of the puddling chamber, as may be found requisite. The patentee says he does not claim the application alone either of blast or steam in the working of an ordinary puddling or other furnace; nor does he confine himself to the details shown and described above, so long as the peculiar character of his improvement be maintained. He claims as his improvements in making bar or wrought iron the use of hot or cold blasts with steam jets, and hot or cold blasts with the damper described, or with the ordinary damper in the draught of the chimney, to regulate the heat in the said puddling chamber; and he claims the use of hot or cold blasts and steam jets, and steam jets themselves, to regulate the heat in the said puddling and preparatory chambers respectively, instead of the ordinary damper.

Mr. Nasmyth's well-known patent for "An improvement in puddling iron," dated May 4, 1854, and described in this Magazine for Nov. 25, 1854. (See *Mech. Mag.*, vol. lxi. No. 1,633, p. 523.) In carrying it out, Mr. Nasmyth "subjects the molten cast iron in the puddling or refining furnace to the action of a current or currents of steam, introduced as nearly as practicable to the lowest portion of the molten iron, and thence diffused upwards, so as not only mechanically to agitate the molten iron, and thereby keep exposing fresh surfaces of the iron to the oxygen contained in the atmosphere passing through the furnace, but also, when brought into contact with the incandescent iron, to be reduced to its elements and yield oxygen, which will chemically combine with the carbon of the iron as well as with the sulphur or other oxidizable substances of the iron with which it may come into contact and have affinity, and thereby deprive the iron of those impurities, whilst the other component of the steam simultaneously liberated, namely, hydrogen, is free to combine with any sulpher present in the furnace, whether as an ingredient in the iron or as a product of combustion of the fuel employed for heating the iron, and thus substances very prejudicial to the quality of the iron will be removed or prevented from combining therewith, whilst, at the same time, the operation will be materially expedited.

Another patent (the next in order) that bears upon a portion of one of Mr. Bessemer's patents, is that of Captain Uchatius, of Vienna, for "An improvement in the process of manufacturing cast steel," dated Oct. 1, 1855, and described in this Magazine 10th May last. (See *Mech. Mag.*, vol. lxiv. No. 1,709, p. 441.) The object of the inventor is to reduce the cost of manufacturing the cast steel, by economising the labour of the process. The following is an abstract of the specification of his patent: Iron of the purest quality is taken and melted in a suitable furnace, and while in a molten state, is run into cold water, and thereby reduced to a granulated iron. It is then in a suitable condition to undergo the process which will convert it into cast steel. This process is founded on the fact that cast iron, surrounded by any oxygenised materials, and subjected to a cementing heat for a given time, will yield up a portion of its carbon, which will combine with the oxygen driven off from the surrounding materials, and form carbonic oxide, or carbonic acid gas. If this process is interrupted before the completion of the process, a partially decarbonized iron will result, the surface of which will have been converted into pure iron, while the interior parts remain unchanged. Or, in other words, the progress of the decarbonising action will depend on the amount of metallic surface brought into contact with the oxygen-yielding material with which the iron is surrounded. In order, therefore, to expedite this operation the pig iron is reduced, as before-mentioned, to a granulated state, and further to economise fuel and labour, the inventor avails himself of the heat required for effecting the decarbonisation of the iron, to reduce the metal when sufficiently decarbonised to a molten state, and thus by one and the same heating to convert it into cast steel, which need only be forged to prepare it for the market.

The next inventions to be noticed are

those of Mr. Joseph Gilbert Martien, of Newark, New Jersey, United States. Mr. Martien has four patents, to one of which a correspondent drew the attention of our readers, at page 231 of our number for Sept. 6, No. 1726. The substance of each of these inventions has been given in this Magazine among the abstracts of "Specifications of Patents recently Filed." (See *Mech. Mag.*, vol. lxiv., No. 1704, p. 328, No. 1706, p. 377, No. 1707, p. 402, and No. 1711, p. 498.) It will be well, however, to notice them again here.

Mr. Martien's first patent is for "Improvements in preparing certain oxides of iron for use, and for apparatus to be used therein," and dated Aug. 23, 1855. These improvements consist in purifying certain oxides before using them in the manufacture of iron, by first subjecting them to heat in a reverberatory or other furnace, and then subjecting them to the action of streams of air forced into the mass by a blowing apparatus, and also to streams of steam, or of water.

His second patent is for "Improvements in roasting, calcining, oxydizing, and subliming metallic and mineral substances, and in the apparatus and means to effect the same," dated Sept. 5, 1855. This invention mainly consists in applying steam through and amongst such substances when being so treated; and in certain means of applying streams of air to and amongst such substances when being so treated.

His third patent is, however, the most important one. It is for "improvements in the manufacture of iron and steel," dated September 15, 1855. As much controversy, and probably litigation, is likely to arise respecting this patent, it is important that it should be thoroughly understood. Mr. Martien's *provisional* specification was as follows:—This invention "consists in the application of atmospheric air by mechanical pressure, or of water, vapour of water, or steam (more especially steam), for the better purification of the liquid or melted metal and below the surface of the said metal, as it comes from a blast or smelting furnace, as also from a refining or finery fire; the air and steam to be applied in their natural or heated state, together or separately, as may be desired, and in such manner as to completely penetrate and search every part of the said metal as it comes or after it has flowed from a blast or smelting furnace, and prior to the congelation of the said liquid or melted metal in the form of pigs or otherwise. It may be necessary under some circumstances to continue the *heat for a time to* the liquid or melted metal, *for the more effectual treatment* by the action *of atmospheric air, water,* vapours of water, or steam, or either, in the manner above stated. In treating the liquid or melted metal as stated, either as it directly comes from a blast furnace or from a finery fire, it is left in the form of pigs, plates, or in a granulated state, as may be desired; or it may be conducted after such treatment directly and without material loss of heat to a reverberatory or other furnace or furnaces, and there subjected to intense heat and manipulation, and speedily converted into balls of malleable metal of iron and steel." From the *final* specification we take the following: "This invention has for its object the purifying iron when in the liquid state from a blast furnace, or from a refinery furnace, by means of atmospheric air, or of steam, or vapour of water applied below, and so that it may rise up amongst and completely penetrate and search every past of the metal prior to the congelation, or before such liquid metal is allowed to set, or prior to its being run into a reverberatory furnace in order to its being subjected to puddling, by which means the manufacture of wrought iron by puddling such purified cast iron, and also the manufacture of steel therefrom in the ordinary manner, are improved. In carrying out my invention, in place of allowing the melted iron from a blast furnace simply to flow in the ordinary gutter or channel to the bed or moulds, or to refinery or puddling furnaces, in the ordinary manner, I employ channels or gutters, so arranged that numerous streams of air, or of steam, or vapour of water may be passed through and amongst the melted metal as it flows from a blast furnace." * * * "In place of the gutter being the means of applying streams of air below the fluid iron as it comes from a blast furnace, the moulds or bed into which the melted iron is received may be arranged with means for introducing air or steam below the melted iron, and to divide such air or steam into numerous streams, so that the iron may be purified thereby after it has come from the blast furnace and before the congelation of the liquid metal takes place." * * * * "The iron thus purified may be allowed to cool in the moulds, or it may be run from the gutter, channel, or receiver into a reverberatory or suitable furnace, to be highly heated therein, and may be puddled in the ordinary manner." * * * "What I claim is, the purifying iron from a blast furnace or a refinery furnace whilst still in a melted state, as herein described."

Now the question is whether Mr. Martien's specification — for his claim rests upon that, and that alone—comprises Mr. Bessemer's process. Probably the real opinions of persons are much divided upon this point; their expressed opinions are, of

course, since where the interests involved are considered to be great, some are sure to be found to take sides respecting it. To the statements that have been made in some quarters to the effect that some of the specifications were tampered with, we do not feel disposed to give heed. We cannot, however, leave the question without remarking that many of the attempts that are here and there made to show that the later patentee occupies an impregnable position, evince but very little knowledge of Patent Law on the part of the writers. On the other hand we cannot join in the grief of Mr. Mushet, who is "very sorry to see Mr. Bessemer as an amateur iron-maker, and no doubt a very intelligent and deserving person, being entangled into a number of further patents, to endeavour to secure, by a succession of impracticabilities, a matter which has irrevocably gone from him since Sept. 15, 1855," because we think the judgment which he has evidently arrived at has been prematurely reached. It is perfectly certain that if by either Mr. Bessemer, or Mr. Martien, or by both of them, considerable good sense is not displayed, the lawyers will reap great benefits from their inventions for some time to come.

It may be well also to record that an invention has recently been brought forward in France, as one somewhat analogous but superior to Mr. Bessemer's. The inventor is M. V. Avril. "M. Avril," says M. Solomon of the University of Public Works, "proposed to himself the problem of enabling the metallurgist to produce from the blast furnace itself cast-iron, steel, or iron, at will, and has, it appears, solved the problem. "This he effects by the following means: —1. A modification of the blast furnace at present in use. 2. Tuyeres round the bottom of the furnace. 3. Use of pure oxygen. From a combination of these arrangements an economy of one-fourth of the fuel necessary to bring the metal to fusion is produced. In the invention of M. Avril a blast furnace only is needed, and by it the inventor expects to be able to produce iron or steel at a cheaper rate than by that of M. Bessemer. M. Avril's invention has, so far as the experiments have yet gone, been successful, but its importance and commercial value are about to be tested by the construction of a blast furnace from his designs."

We have left ourselves no space for any lengthy remarks upon the iron and steel produced by Mr. Bessemer. It must, therefore, suffice to say that, although some of the results of experiments made with Mr. Bessemer's *process* that have been communicated to us appear very unfavourable, the metal produced by Mr. Bessemer has generally been found of excellent quality.

INSTITUTION OF MECHANICAL ENGINEERS.

THE Birmingham Institution of Mechanical Engineers has recently held a meeting in Glasgow, which was well attended by gentlemen from Birmingham, Manchester, Bradford, Edinburgh, and other principal towns. It was opened by a speech from Mr. Joseph Whitworth, the President, in which he spoke highly of Mr. Bessemer's process, urged the construction of light railway carriages, called attention to "the two great elements in constructive mechanics, viz., a true plane, and the power of measurement," (illustrating his remarks by exhibiting a small machine, by which a difference in the length of the one-millionth part of an inch is detected by the sense of touch), pointed out the necessity of proper gradations of size in all the branches of the mechanical arts, congratulated the audience on the recent progress of the mechanical arts and the increase in workmen's wages, referred to the desirability of improving the education of young operatives, predicted that all harvest operations on land properly laid down will very shortly be performed in one-fourth the time now expended in hand-labour, and expressed a hope that the time is not far distant when all remaining legislative obstacles to the progress of the mechanical arts will be swept away.

Several papers were read. Some were explanatory of inventions already described at length in this Magazine. The others will be published hereafter.

THE AMERICAN FLOATING BALL WASHING MACHINE.

THIS machine, which attracted a good deal of deserved attention at the Paris Exhibition, where very many of its counterparts were purchased by the English, is now being manufactured to a great extent in this country, and a depôt has been opened at Mr. Moore's, in High Holborn, for the purpose of informing the public as to the nature of its operations. We have closely inspected this machine, and seen it at work. A number of wooden balls,—more or less, according to the trough in which the clothes are to be washed,—are set in motion by a handle worked by a lever, and which agitates an apparatus on which the linen is placed. This movement causes the balls to rub against each other, but only with sufficient percussion to pound

the material to be cleansed, and by their excentric action imitate to a nicety all the routine of a washerwoman's duties. In this way clothes are washed far cleaner than by the ordinary method, and with singular rapidity. The threefold operations of pounding, rubbing, and squeezing are done at the same time; and as the floating balls offer only a limited resistance to each other, the finest fabrics are free from that injury which is consequent upon the ordinary course of proceeding. The wear is, moreover, much less; and not even a button has, it is said, been known to be torn off by the thousands of the machines now in use throughout Europe and America. The consumption of soap is smaller, and no necessity for boiling is necessary, excepting in the case of extreme foulness. The hands of the operator, which may be a child, are never immersed in the water, and consequently there is no fear of that blistering, chapping, and bleeding of the fingers attendant upon the poor washerwoman's pursuits. It seems to us an excellent labour-saving machine, and one the permanent character of which is alone to be estimated by the wear of the wood with which it is made.

NEWMAN'S COLOURED PHOTOGRAPHS.

We have been favoured by Mr. Newman, of Soho-square, with a view of some photographs colored with his "Improved Photographic Colors." The effect is life-like, all the delicacy of the most elaborate photograph being preserved with the addition of colour. Mr. Newman informs us, that the process of colouring is excessively easy, and only requires taste on the part of the amateur, to produce effects more *life-like* than can be produced by any other species of colouring. We should think our female friends would be delighted with so lady-like, useful, beautiful and cheap an occupation.

ALUMINIUM AN OBJECT OF TRADE.

This metal has become already cheaper than silver, and is sold in Paris for 300 francs the kilogramme; but, being very light, it will reach five or six times the extent of silver. Very nicely-made tea and coffee-pots, spoons, &c., are already to be seen in the shops of the jewellers of the French capital.—*Builder.*

SCIENTIFIC INTELLIGENCE.

Jewels and Precious Stones.—Persons pursuing "the even tenor of their ways," will scarcely form an idea to what extent the commerce of these unnecessaries of life is now carried on. The late fair of Frankfort was literally crammed with diamonds, emeralds, rubies, sapphires, and pearls, all which articles have, since the conclusion of the peace, nearly doubled in price, being given away on snuff-boxes, coronation toys, &c. It is worthy of notice that the old (*Dutch*) fashion of cutting precious stones has become of late again more accepted and fashionable, and that the modern cut is already gone out of estimation. Since Col. Mitchell brought one diamond home from Australia (deposited in Jermyn-street), no more have been transmitted hither, although from geological analogy, there can be no doubt that the Five Confederated Provinces do also conceal large masses of this valuable sort of carbon.

New Building Materials. — The northern steeple of the Dom of Cologne is now building of *basalt-lava*, an improper expression, as all basalt is lava. The stone used is the basalt-lava of the Perlenkopf, one of the many (extinct) volcanic summits which compose the mountain tiers between the Laacher See and the Aarthal. This basalt-lava is harder than that of Niedermending, also on the Rhine, and may be considered the hardest building material hitherto known.— The southern states of Australia, where most of the gold has hitherto been found, abound also in the finest building and sculptural stones. Carrara marble, syenite, granite of all colours and sizes, serpentine, &c., which, if a railroad once lead to Menero Downs, or Twofold Bay, will be either used for the erection of the Australian Capitol, or shipped to London. The whole outskirts and the mass of the Australian Alps are composed of such valuable primitive rocks. Several collections containing fine specimens of the above rocks, from Australia, have been purchased by the trustees of the British Museum of me, and are deposited in the geological department.

Salt in the Ocean—Professor Noeggerath in his fine monography on the above subject, says,—"that although the area of the oceans and the amount of salt dissolved in their waters may be known, yet, as the depth is an uncertain magnitude, it is difficult to calculate the amount of salt therein contained." Breislack has calculated that the oceans contain 190,000 billions of cwts. of salt, which is equal to 142,000 billions of cubic feet of salt. This mass would amount to the size of a globe of

650,000 feet (27 leagues) diameter. Professor Noeggerath thinks, that the oceans of the primæval worlds were not so salt as they are at present, as the organism and constitution of the large Saurians which inhabited their outskirts, were not compatible with that quality.

[*Communicated by* DR. LOTSKY.]

15, Gower-street.

TONNAGE REGISTRATION AND MERCANTILE STEAM TRANSPORT.

To the Editor of the Mechanics' Magazine.

SIR,—Referring to your editorial article in the *Mechanics' Magazine* of the 20th inst., No. 1728, I am reluctant to renew our discussion on the tonnage question, because, really, so far as I can gather from your past and present reviews of my papers, we are perfectly of one accord on the subject matter involved in our discussion, namely, the desirableness, in a public point of view, of rendering our Statistics of Shipping Registration more complete than they now are under the Merchant Shipping Act of 1854. The object with which, from the first, I have availed myself of the facilities so liberally afforded by the Society of Arts, by the *Mechanics' Magazine*, and by the British Association, for bringing questions of this character before the notice of the public, has been to elicit thorough investigation into the merits of the question, and obtain a demonstration of public opinion thereon, through some channel having recognised claims for being regarded as an exponent of the sentiments of that section of the public who interest themselves in scientific questions of this character, for, without such an expression of public opinion, a case would not be satisfactorily established on which the revision of an Act of Parliament could be reasonably entertained. This, my object, has been fully attained, for, in addition to the mark of approbation awarded to me at the Society of Arts (the Society's medal), and the fact of the British Association having referred my papers to Committees of the Mechanical and Statistical Sections, the articles which have appeared in the *Mechanics' Magazine*, not merely as the contributions of a correspondent, but expressly put forward as editorial reviews, are surely entitled to the deference which attaches to the expression of opinion by the literary exponent of an influential, and, in this matter, a peculiarly qualified section of the public; and when it is further considered that this authoritative declaration of opinions is put forward and advertised as a comprehensive review of the "Tonnage Question," it is, I beg to assure you, with the greatest satisfaction that I forego any petty points of difference of opinion that may exist between us as to any suggestions which I have made, with a view to remedying the deficiencies of our present system of "Tonnage Registration." I am proud to regard myself as acting in co-operation with the Editor of the *Mechanics' Magazine*, as the organ of the section of the public before adverted to, claiming the revision of the Merchant Shipping Act of 1854, as respects the admeasurement for tonnage and the registration of shipping on grounds so forcibly expressed and so spontaneously advanced in the editorial articles of the *Mechanics' Magazine* in the following terms:

1. Because "the tonnage measurement and registration of vessels has never been brought before Government in any other than a purely fiscal point of view."

2. Because "Government in legislating on tonnage registration has not contemplated [the scientific features of the case, nor those which bear on the sea voyage."

3. Because "undoubtedly there is a point beyond which ships cannot be safely loaded."

4. Because "undoubtedly it would be desirable, if possible, to fix a limit to the degree to which ships may be loaded."

5. Because, "as regards the draught of water at which ships leave port, let the Board of Trade have, if it so please, properly authorized officers to note and record the above facts."

6. Because "we would see with satisfaction a competent Committee appointed by Government, or by the British Association, with a view of ultimately, if need be, acting on the Government, to take into consideration the foregoing points."

7. Because "some definite displacement of a vessel involving the settlement of the whole weight, when fully equipped for sea, being necessary datum for any scientific inquiry, it may be worthy of consideration

whether the constructor of every vessel may not be required to furnish to the Board of Trade, for the purpose of registration, what he designs to be the vessel's load displacements."

8. Because, "in vessels of war, the constructor always fixes and calculates the load displacement, and there seems no reason why this course should not be pursued with regard to merchant ships."

9. Because "we do not anticipate any great repugnance on the part of shipbuilders and ship-owners to register what may be taken as the mean fair load of the ship."

10. Because "a knowledge of the weight of cargo designed to be carried by each ship being the difference of the constructor's load and light displacement, would (if it should please the Legislature to require such registration) supply all the information that could be fairly required for statistical purposes."

11. Because, "the nominal horse-power of a marine engine gives no indication whatever of the real power to which it can work; for while some marine engines work up to twice, some will work up to four times the nominal power."

12. Because "to test the value of a vessel propelled by steam, in a mercantile point of view, we require to know the weight propelled and the power actually exerted in propelling it, and also the speed at which it is moved."

13. Because "in a scientific point of view, a more correct mode of estimating horse-power is required."

14. Because "every fresh vessel of improved form and steam-power application tends to lower freights so as to give the public a good share of the advantages resulting from the adoption of good types of build and efficient adaptation of steam-power, so as in a moderate number of years materially to lower the average freight charge for every ship."

15. Because "it must be admitted that there are such deficiencies in the registration of tonnage and horse-power as to render all scientific inferences drawn from those data valueless."

16. Because "what is required is that the registered horse-power should really represent the effective horse-power."

There is just one other point the exposition of which will doubtless meet the concurrence of the Editor of the *Mechanics' Magazine*. I therefore take the liberty of noticing the following tonnage anomaly as an additional ground on which to demand tonnage registration reform, viz.,

17. Because, under the present system *of tonnage admeasurement* and registration, it appears that ships are advertised (see *Times* 20th September, 1856) as being 15,000 tons burthen, whilst their registered tonnage at which these same ships are rated for certain fiscal dues is only 7488 tons.

Such being the comprehensive terms in which the Editor of the *Mechanics' Magazine*, in his editorial articles, has acknowledged the deficiencies of our present system of tonnage admeasurement and shipping and engine-power registration, thus confirming in each of these particulars the statements which I have advanced in my papers, I see no occasion to disturb the harmony of our joint agitation, with a view to the amendment of the law in regard to the fundamental deficiencies above set forth, by raising any questions on the differences of opinion that may exist between us as to the mode of correcting these deficiencies, for on this point also, namely, the amendment of the law, I concur with the Editor of the *Mechanics' Magazine* in paying deference to the decision that may be arrived at by the Committee appointed by the British Association, to consider these matters, the Committee embracing among its members, as is acknowledged by the Editor of the *Mechanics' Magazine*, "Gentlemen some of them eminent for scientific ability, and others for skill as practical builders, which holds out a prospect of impartiality in the conduct of its deliberations." In the hands of such a Committee, the shipping interests will surely have no occasion to apprehend unreasonable interference, nor to proclaim the wail which the Editor of the *Mechanics' Magazine* has been pleased to ascribe to them: "*Timeo Danaos et dona ferentes.*"

I am, Sir, yours, &c.,

CHAS. ATHERTON.

Woolwich Dockyard, Sept. 24, 1856.

MANUMOTIVE WHEEL-CHAIRS.

To the Editor of the Mechanics' Magazine.

SIR,—I am lame, although otherwise in good health. My lameness did not much inconvenience me until for the last five years, when accidental injuries increased it. I have occasionally used one of the concentric wheel-chairs, moved by the inner wheel, and by myself, of course. My object in writing to you is, to ask whether you could obligingly suggest any *increasing power* to this machine? I have sometimes thought that another wheel, or a cogged wheel, might add to the self-driver's power; or, perhaps such an improvement has been already made, and, in that case, will you inform me where such a chair could be ob-

tained reasonably? If you will kindly insert a reply to this communication in your next Number, you will much oblige,

Yours, &c.,

PRESBYTER CLAUDICANS.

[Perhaps some of our readers will be able to supply our correspondent with the information required.]

SPECIFICATIONS OF PATENTS RECENTLY FILED.

DESSALES, A. J. *Improvements in oil lamps and in reflectors for the same for railway carriages and other purposes.* Dated Jan. 25, 1856. (No. 207.)

The patentee forms the reflector circular with a surface something like a trumpet mouth. The upper part is open for the passage of the chimney, and upon it the gallery and chimney are supported. Above the reflector he places two oil boxes or reservoirs, one on either side, which fit as near as possible the concave of the upper side of the reflector, but at the same time leave a space between for the passage of air. The burner is supported in the centre of the reflector by two arms, one from either reservoir. The burner used is the argand or circular wick burner, which is placed on a wire or perforated metal wick holder. The lower part of the lamp is enclosed by a glass dish or plate.

DALGETY, A. *An improved self-acting stand or tilt for casks or barrels.* Dated Jan. 26, 1856. (No. 209.)

This apparatus consists of an upper frame, on which the cask rests on three bearing points. This frame works near the front end of the cask on a V or knife edge. At the back ends of the frame is fitted a tube, closed at the top, and having a spring inside, which spring bears both on the upper end of the holding tube, and on the end of a rod fixed by a pin joint at its lower extremity to the base of the stand. The tube slides upon the rod, and has a detent, which prevents it from being forced downwards, but allows the spring to raise the upper frame as the contents of the cask diminish.

NAPIER, G. *Improvements in the construction and arrangement of the flues, air-passages, and other parts of furnaces, and also in controlling the passage of smoke, and in heating and regulating the supply of air to facilitate combustion.* Dated Jan. 26, 1856. (No. 210.)

This invention consists in an arrangement of two or more furnaces, together with their flues and passages, whereby the smoke, &c., of one fire are returned to the ash-pit of another fire, through which they are passed, accompanied by air, while at the same time the fire whence the smoke is evolved is supplied with a proper amount of air, which is heated in a retort placed in a smoke-box, situated between the boiler flues (when used for boilers) and the chimney.

GARDNER, E. V. *Improvements in heating, drying, desiccating, and evaporating.* Dated Jan. 26, 1856. (No. 212.)

This invention requires illustrations to describe it.

DORAN, P. *Improvements in pneumatic apparatus for raising sunken vessels or other bodies under water, and for keeping afloat vessels or other bodies liable to sink.* Dated Jan. 26, 1856. (No. 213.)

This invention consists of certain air-tight and water-tight bags or tubes. In each bag is inserted a pipe or nozzle so constructed that it may be attached to a flexible pipe (air-tight and water-tight), the pipe or nozzle to be fitted with a clack-valve to prevent the escape of air when the bag is inflated. In order that the bags may be preserved from accident, and to protect them from excessive pressure, it is intended to encase each in a network of flexible material, and also with bearing-straps or bands to which will be fastened strong clip-hooks for attaching therewith the bags to such article as may be required to be raised.

HUILLARD, J. L. A. *Improvements in the processes of singeing and dressing textile fabrics, and in apparatus for the same.* Dated Jan. 26, 1856. (No. 214.)

The improvement in singeing consists in passing such fabrics over a metallic surface treated by *superheated* steam. The improvements in dressing consist—1. In the employment of metallic cyanides (preferably the cyanides of zinc or tin) as dressing for fabrics, in lieu of gum, starch, size, etc., the cyanides being fixed in the fabric by passing the fabric over a vessel in which superheated steam circulates, whereby the metallic dressing becomes oxidised. 2. In the employment in like manner of a siliceous dressing for fabrics, which is fixed in the fabrics by exposing them to the action of superheated steam as in the case of the cyanides, whereby the dressing becomes vitrified.

SPURRIER, W. *A new or improved method of attaching handles to metallic tea-pots and other vessels, which method of attachment may also be applied to the fixing of castors on furniture and other like purposes.* Dated Jan. 26, 1856. (No. 215.)

This invention consists in causing the turned-in-ends of a slit tube in the interior of the socket, to which the handle or other article is to be fastened, to engage in a groove or notch on the handle or other article.

STATHAM, S. *Improvements in electric telegraph conductors.* Dated Jan. 26, 1856. (No. 216.)

The patentee forms a conductor of a hollow strand or cord of metal wires laid spirally by any suitable machine, or of wires formed into a hollow tube by a braiding or other machine, and in either case with or without a core of gutta percha, caoutchouc, or other elastic material. He employs copper, iron, or any other suitable wires, and forms his hollow conductor of a diameter proportionate to the extent to which it may be required to be stretched.

DRESCHFELD, W. *An improvement in, or addition to, rollers employed in spinning.* Dated Jan. 26, 1856. (No. 217.)

This invention consists in adapting to any roller employed in spinning a shield or apron, which comes in contact with the roller, keeps it clean, and prevents the agitation of the air acting on the filamentous substances operated on.

BEASLEY, W. *Improvements in machinery or apparatus to be employed in rifling the barrels of fire-arms and ordnance.* Dated Jan. 26, 1856. (No. 218.)

This apparatus requires drawings to illustrate it.

WORMALD, J. *Certain improvements in machinery or apparatus for folding, "fenting," and making up goods or fabrics.* Dated Jan. 28, 1856. (No. 222.)

This invention consists in machinery in which the cloth or fabric to be folded is passed over a curved or semicircular surface or bed, formed in three divisions or parts, having the centre division capable of being raised and lowered when necessary. To this curved bed, together with its framing, is imparted a horizontal reciprocating sliding motion, &c. For "fenting," the patentee employs a knife actuated by any suitable self-acting means, cutting across the fabric from selvedge to selvedge.

D'AUVERGNE, J. B. J. H. *Improvements in portable writing or drawing-desks.* Dated Jan. 28, 1856. (No. 225.)

This invention consists in the construction of a light portable desk, adapted for use in a standing posture, designated a cartograph. The simplest way of making it is to take a piece of thin band, and fit to each side a small rod secured to the board by hinges. The rods are connected by a cord or strap, which, when in use, is passed round the neck of the person, the rods lying against the breast; the desk being thus hung may be adjusted to any required position by means of the hinges.

SAMAIN, P. *Improvements in tables, stools, and other pieces of household furniture.* Dated Jan. 28, 1856. (No. 226.)

The patentee describes a portable table, in which are arms, upon which the top of the table is placed, and legs which support the pillar; these legs are made with tenons, which fit into mortices in the pillar, and are secured by pins. This arrangement permits of the legs folding together. There is a nut having an internal screw made therein, which takes on to a screw when the table is set up, and this nut is screwed up and keeps the legs firm. The patentee also constructs other articles of furniture in a somewhat similar manner.

GUÉRINOT, P. E. *Stopping instantaneously two railway trains running against each other.* Dated Jan. 28, 1856. (No. 227.)

This invention consists in applying pointed iron rods placed on one side of the head cross piece of locomotive engines and waggons, and blocks of lead or any soft material placed on the other side, so as to have the point of one vehicle to meet the block of the other, in order to deaden the concussion.

ASBURY, W. *A new or improved tap or stop cock.* Dated Jan. 28, 1856. (No. 230.)

This invention consists of a tap or stop cock, in which a rotary motion is communicated to the valve by means of a plug having a flange working upon a bed or seat, which flange is pressed upon the bed or seat by the fluid.

DESTIBEAUX, J. H. *An improved waterproof fabric.* Dated Jan. 28, 1856. (No. 231.)

The patentee prepares a waterproof fabric as follows:—He first applies on the upper and under surfaces of a cotton or linen fabric, such as moleskin, a coating composed of boiled linseed oil rendered siccative by litharge mixed with calcined amber and lamp-black, and liquefied, where found necessary, by the addition of a small quantity of the essence of turpentine.

WHITEHEAD, J. *Improved machinery for fulling cloth.* (A communication.) Dated Jan. 28, 1856. (No. 232.)

This invention consists—1. In grooving and fluting certain of the pressing rollers; and, 2. In the use of a chamber for permitting the accumulation of the endless web of cloth, and yet, at the same time, presenting no obstruction to the continuous traverse of the cloth through the machine, such chamber being fitted with a swing valve.

KING, H. S. *Improved apparatus for printing and embossing.* (A communication.) Dated Jan. 28, 1856. (No. 233.)

The patentee mounts a printing block or stamp on a vertical sliding rod, which is carried by a rigid swinging arm, supported on a pillar that stands up from the bed plate of the stamping apparatus, the object being

to print and emboss by mechanical means instead of by hand.

FOXWELL, D. *Improvements in sewing machines.* Dated Jan. 29, 1856. (No. 236.)

This invention consists in the use of two straight needles and one hooked, one straight needle working vertically and one horizontally. In one arrangement, the vertical needle is caused to pass down through the material to be sewn, and the second needle working horizontally to pass through the loop of the vertical needle; then the hook holds the loop until the vertical needle in its next descent has passed through it; the horizontal needle again passes through the loop of the vertical needle, and so on.

LANCASTER, W. H., and J. SMITH. *Improved arrangements for the application of gas and atmospheric air to the generation of heat in furnace or other flues, and the consumption of smoke.* Dated Jan. 29, 1856. (No. 237.)

These arrangements consist in placing the retorts in which the gas is generated in the fire-place of a furnace. The arrangements for the combustion of the gas in the flues consist of pipes for conveying the gas to several sets of jets, disposed along the flues; and of plates arranged to form channels in the flues to convey to the jets a supply of atmospheric air.

CHANCE, H. *An improvement in the manufacture of moulded articles, when using vitreous materials.* Dated Jan. 29, 1856. (No. 242.)

This invention consists in moulding articles from pulverised vitreous matter, such as waste glass, and heating the articles so moulded into a compact mass.

GLADSTONE, S. P. *Improvements in the construction of masts and yards.* Dated Jan. 29, 1856. (No. 243.)

The lower part of a mast is made tubular of metal, and is fixed to the keelson by a flanch and bolts. The tubular part comes above all the decks but the upper deck, and into this tubular part filling pieces are introduced on to which the end of the upper part of the mast which is of wood steps. In constructing a yard the middle portion is made of metal and hollow to receive two ends of wood.

WALTON, J. F., and H. LE FRANÇOIS. *Improvements in cleaning forks, spoons, stewpans, and other culinary utensils.* Dated Jan. 29, 1856. (No. 244.)

The articles to be cleaned are placed in drums containing brushes which revolve with them, the articles to be cleaned being held stationary. The drums are mounted on an axis, and motion is given thereto by a winch handle or a crank.

POPE, A. *Improvements in the manufacture of iron, copper, tin, and lead.* Dated Jan. 29, 1856. (No. 245.)

This invention comprises a number of processes too elaborate to be detailed here.

WINFIELD, R. W. *An improvement or improvements in the manufacture of metallic bedsteads and other articles of metallic furniture.* Dated Jan. 30, 1856. (No. 247.)

Claim.—Making the ornamental and exposed portions of metallic furniture of zinc, coated with an electro deposit of copper or brass, or of iron first coated with zinc and afterwards with copper or brass.

CLAUS, C. F. *Improvements in the preparation of hides or skins, also applicable to the preparation of the entrails of animals.* Dated Jan. 30, 1856. (No. 250.)

This invention consists in steeping the hides, skins, or entrails of animals in a bath of glycerine, or any diluted solution thereof.

NEWTON, A. V. *An improvement in the manufacture of cannon.* (A communication.) Dated Jan. 30, 1856. (No. 251.)

A cannon is first cast in the usual manner, but having in its largest part a diameter about twice as great as the intended calibre. The casting is then bored and turned so as to give its periphery two or three different diameters, the cylindrical portions extending from the breech to beyond the trunnions being larger than the others. Upon these portions a screw is formed. The next thing is to form several hoops of wrought iron, turned upon the inside, and having a female screw cut upon their inner surface to fit the threads before described. The internal diameter of the finished hoops is about one thousandth part less than the male screw that they are to encircle. The hoops are then heated to expand them, and screwed into their places.

STEVENS, J. L. *Improvements in doors or apparatus for regulating the supply of air to steam boiler and other flues and furnaces.* Dated Jan. 30, 1856. (No. 254.)

This invention consists in combining apparatus for the admission of atmospheric air at the back of steam-boilers by perforated doors, which allow of the supply of air being regulated proportionately with the more or less bituminous nature of the coal.

GRETTON, J. *Improvements in brewing.* Dated Jan. 30, 1856. (No. 255.)

This invention relates to the lowering of the temperature of wort by cold water, and to the regulating, lowering, and raising of the temperature of ale, beer, or porter, during or after the process of fermentation, and it consists in the employment of a hollow vessel, and in passing cold or warm water, or steam, through and out of the said vessel.

HOLFORD, H., and M. MASON. *Improvements in machinery or apparatus for compressing metals, and for manufacturing all kinds of metallic rivets, bolts, or similar articles.* Dated Jan. 31, 1856. (No. 257.)

The improved machinery cannot be clearly described without illustrations.

MASH, J. *Improvements in working the valves of steam engines.* Dated Jan. 31, 1856. (No. 259.)

The principle feature of this invention is, that the movements imparted to the valves or other regulators of steam approach very nearly to that of intermittent actions, and are such that relatively greater rates of velocities than usual are imparted to the valves just before and during the opening of the steam ports and the exhaust ports.

TYLOR, H. *An improved joint applicable to cots, bedsteads, and other frames in metal.* Dated Jan. 31, 1856. (No. 261.)

This invention consists in connecting metallic frames by means of projecting cheeks, which are placed in one piece, and receive between them the flattened ends of the other pieces, a pin being passed through the whole.

TURTON, J. B., and J. ROOT. *Improvements in buffer-bearing and draw-springs.* Dated Jan. 31, 1856. (No. 264.)

This invention consists in applying for such springs a combination of the spiral spring with screw inclines, so arranged that the elastic force of the spring is taken advantage of both in the direction of its axis and round its axis. The best arrangement is this:—Two cylinders have formed on them screw inclines, in such manner as will cause one or both of them to revolve when made to approach the other. The spiral spring surrounds these cylinders, one end being secured to one of them, and the other end to the other.

COTTAM, G. H., and H. R. *Improvements in folding bedsteads and chairs.* Dated Jan. 31, 1856. (No. 267.)

This invention consists—1. In combining a series of metal frames into a bedstead, the frames of which, when the bedstead is out of use, pack and retain the form of frames. 2. In a combination of metal frames for making a portable chair. 3. In a mode of combining woven cane surfaces with the metal frames of chairs and bedsteads.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

PEAK, J. *Improvements in machinery or apparatus for pointing and turning bolt-heads, facing nuts, centreing, drilling, and similar purposes.* Dated Jan. 25, 1856. (No. 202.)

This machinery cannot well be described without illustrations.

INGALL, G. H. and G. O. S. BROWNE. *An improved method of railway signalling. Dated Jan. 26, 1856.* (No. 208.)

This invention consists in placing upon the line, in such places as tunnels, curves, &c., an apparatus, and also in attaching to the engine another kind of apparatus, which is acted upon by the former. The apparatus attached to the line acts upon that on the engine, in such manner as to sound the whistle, &c.

JOHNSON, J. H. *Improvements in compressed air locomotive engines.* (A communication.) Dated Jan. 26, 1856. (No. 211.)

This improvement consists in the employment of a small steam engine and boiler to be carried on the main framing of the locomotive, for working two or more double action air pumps, which compress the air into a receiver or magazine, whence it is delivered by suitable stop valves to the main actuating cylinders of the locomotive, such cylinders being of the ordinary size and construction, and fitted with slide valves and gear precisely similar to those employed in locomotives.

WALKER, A. J. and W. BENNETT. *An improved method of forming hat bodies, or other felted articles.* Dated Jan. 26, 1856. (No. 219.)

Upon a sheet of elastic material, while flat and level, the inventors cause fur, wool, or similar felting material, from a suitable picker, to be deposited uniformly. They then apply a second elastic fabric to cover up the felting material, and attach the two sheets together at their edge. They then draw or warp the elastic fabrics with the intervening felting material around a cone-former or mould of the shape required for the felted goods, and then, by motion given to one or both of the elastic fabrics, the intervening felting material is felted together, so that the same will be found, upon moving the outside elastic covering, to be properly shaped and felted, ready for removal from the cone.

LONGBOTTOM, A. and W. LONGMAID. *Improvements in apparatus for generating and heating steam.* Dated Jan. 28, 1856. (No. 220.)

The water to supply the boiler is first introduced into a vessel arranged with a system of hot water pipes to heat the water by preference to about 212 deg. Fahr. The water is pumped from this vessel into the steam generator, in which is arranged an extensive series of hot water pipes suitable for converting the water into steam, and in some cases in addition to internal heating pipes, the generator has also heating pipes outside. The steam generated in the generator, both in the boiler and in the steam pipe leading to the steam cylinders, comes in contact with a series of hot water pipes, by which its temperature is raised more and more up to the time of its entering the valve boxes.

BROWN, P. and G. BROWN. *Improvements in the method of cleaning, dressing, and preparing a certain description of seeds or grain, called "dari," and frequently called "millet," and thereby rendering the same suitable for food.* Dated Jan. 28, 1856. (No. 221.)

This invention consists in cleaning, dressing, or preparing the "dari" by the adaptation thereto of a similar process and machinery to that now employed in the cleaning and dressing of rice, and in afterwards grinding the dari in flour if required.

HILLIARD, H. *Improvements in articles of cutlery, and in apparatus for sharpening and cleaning the same.* Dated Jan. 28, 1856. (No. 223.)

This invention relates to "frame-backed razors." In the improved "frame-backed razors" the thin cutting blade is held by transverse screws or pins.

JULLIENNE, A. M. *Improvements in breaks for railway trains.* Dated Jan. 28, 1856. (No. 224.)

The inventor causes the train to stop of itself at each stopping place, by disposing on the side of the way, and before the arrival at each such place, a moveable stand which catches a lever as the train passes, and opens a cock by means of a rod, which cock admits steam into the cylinder of single-action engine, and by urging forward the piston puts on the brakes, which are of an improved construction.

BARROW, R. *An equilibrium slide valve for steam engines.* Dated Jan. 28, 1856. (No. 228.)

This invention consists—1. In the construction of the valve. The inventor allows a disc or piston to pass through a stuffing box in the slide valve, the piston to be in sectional area as the number of inches on the face of the valve in contact with the steam. 2. In the manner of supplying the cylinder with steam. He takes the steam through the middle or exhaust passage up into the valve, and over the division between the ports on the cylinder face, and down the ordinary passages into the cylinder, and he makes the valve box his eduction box from both passages of the cylinder, and connects from it to the condenser, or carries the exhaust at once into the atmosphere.

GOODE, S. J. *A new or improved gas stove.* Dated Jan. 28, 1856. (No. 229.)

In this invention the gas is allowed to escape from a burner into a metallic chimney, the top of which is closed with wire gauze. The gas mixes with the air in the chimney, and the inflammable mixtures are united above the wire gauze. The chimney is in a conical flue up which air from the apartment circulates; the said flue opens into a chamber constituting the body of the stove, into which chamber the heated air and products of combustion pass, and from which the air, after having partly given up its heat to the said chamber, may either enter the room, or pass off by means of a flue.

DARLINGTON, G. *Producing oxide of zinc from its ores.* Dated January 29, 1856. (No. 234.)

This invention consists in taking any of the varieties of zinc ores, and introducing them into a blast or reverberatory furnace. They are to be mixed, as may be necessary, with any substances yielding silicate of iron, silica, or any siliceous matter, oxide of iron, or iron and coke, or any suitable carbonaceous matter, and exposed to heat to create the necessary chemical reactions to produce oxide of zinc.

SIMMONS, W. J. *An improved governor for steam and other engines requiring governers.* Dated Jan. 29, 1856. (No. 235.)

This invention consists in the employment of springs or thin blades of metal, or other material, instead of levers, to carry weights. One form of the improved governor consists of two springs or blades of steel, each bent into the shape of a semicircle and united at the top to a boss affixed to a spindle. The other ends are joined at bottom to a collar free to slide up and down the spindle. At a point about equidistant from each end of each blade a heavy ball or weight is affixed.

THATCHER, R. *Certain improvements in preparing for doubling or spinning cotton or other fibrous substances.* Dated Jan. 29, 1856. (No. 238.)

The inventor subjects the coils from the carding engine to a succession of easy draughts; and employs a new method of treating the produce of the condensing carding engine.

FLEMING, J., and G. FYFE. *The consumption of smoke in engine and other fires.* Dated Jan. 29, 1856. (No. 239.)

This invention consists in placing a division upon the centre of the furnace bars, and each side of the division is provided with a damper (at the bridge), so that at the time of firing on one side the damper on that side is to be closed, and the smoke made to come back over the fire on the other side.

MURRELL, O. *Improvements in swing looking-glasses.* Dated Jan. 29, 1856. (No. 240.)

This invention consists in constructing the knobs of looking-glasses in a peculiar manner.

FOWLER, W., and W. MCCOLLIN. *An improved thrashing-machine.* Dated Jan. 29, 1856. (No. 241.)

The inventors place three or more shafts transversely of the machine, and connected together by connecting rods and cranks,

and on these shafts are fixed hollow eccentric wheels, the space between which is filled up by wire work.

BERGEVIN, A. M. M. DE. *Improvements in preparing coal for burning and in the furnaces employed in consuming such coal.* Dated Jan. 29, 1856. (No. 246.)

In this invention the coal is first coated with a combination of bicarbonate of soda and nitrate of potash, or other salts of an alkali or alkaline earth in solution in which lime is mixed, and is then dried. The furnace for burning the above fuel is furnished with two sets of fire-bars, one above the other, the upper being greater than the lower, and between these bars, as well as at the sides and front of the furnace, streams of air are admitted.

WALSH, J. H. *Improvements in omnibuses.* Dated Jan. 30, 1856. (No. 248.)

The inventor forms a separate seat for each inside passenger, so that he sits with his side to the side of the vehicle. The knees of one passenger pass under the seat of the one in front; to afford room the seats are raised each to a higher level than the one behind it

TOWARD, J. *Improvements in iron shipbuilding, and in iron plates therefor, which plates are also applicable to other purposes where great strength is required.* Dated Jan. 30, 1856. (No. 249.)

This invention relates to strengthening the plates used in the hulls of iron ships at the part where the bulk heads join, or for strengthening the bulk heads themselves, by rolling a longitudinal or transverse rib on the plates.

GOSSAGE, W. *Improvements in the manufacture of certain kinds of soap.* Dated Jan. 30, 1856. (No. 252.)

This invention applies to those kinds of soap which are manufactured by combining certain compounds obtained by the union of silica with soda or potash with true soaps, which are prepared by the combination of alkali with tallow, resin, oil, or other such substances. In the specifications of three several patents, dated 3rd April, 1854, 3rd Aug., 1854, and 23rd April, 1855, the inventor has described certain methods by which he caused such compounds to become combined with such soap. In the experience he has acquired, he has found it desirable to reduce the proportionate quantity of soda or potash contained in the compound which he employs.

PROVISIONAL PROTECTIONS.

Dated August 28, 1856.

2003. Charles Durand Gardissal, of Bedford-street, Strand, London. A mode of treating and preparing sea-weeds or marine plants for manure. *A communication.*

2005. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in shuttles. A communication.

2007. Thomas Watson, of the firm of Girardin and Watson, of Poland-street, Middlesex, pewterers. An improved beer-engine, lever, or lifter and apparatus for fitting the same to counters.

2009. Jean Baptiste Feauveau and Louis Alexander Legrand, both of Brussels, Belgium. An improved apparatus for the purification and the combustion of gas.

Dated August 29, 1856.

2013. John Brown, of Pendleton, Lancaster, surgeon. Improvements in swinging hammocks, and in the construction of bedsteads or couches, and in apparatus connected therewith.

Dated August 30, 1856.

2014. John Fletcher, of Salford, Lancaster, iron-founder, and William Fletcher, of the same place, millwright. Certain improvements in the construction of weighing cranes or other similar elevating machines.

2015. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in fire-arms. A communication from J. E. Halsey, of New York, America.

2016. James Blake and Francis Maxwell, both of Kitchen-street, Liverpool, Lancaster, soap-manufacturers. Improvements in the manufacture of soap. A communication.

2020. Charles Goodyear, of Leicester-square, Middlesex. An improvement in combining gutta percha and asphalt or pitch.

2021. Hezekiah Conant, of the State of Connecticut, United States of America. A new and useful improvement in fire-arms.

2022. Daniel Sutton, of Banbury, brewer. An improvement in the manufacture of cast-iron cooking kettles and such like hollow ware.

2023. John Gregory, of Nelson-square, Surrey. An improved fish-joint or method of connecting rails.

2024. Manoah Bower, of Birmingham, Warwick, manufacturer, and Richard Peyton, of Birmingham, manufacturer, and Joses Weaver Downing, of Birmingham, metallic bedstead maker. Improvements in metallic bedsteads, cots, couches, and other such like articles.

Dated September 1, 1856.

2025. George Hamilton, of Blackland Mill, Paisley, Renfrew, N.B., bleacher. Improvements in treatment or finishing of textile fabrics.

2026. Matthias Edward Bowra, of Basinghall-street, London. Improvements in the laying or placing of rails or chairs for railway and other purposes in the shape of beds or springs or elastic sleepers.

2027. Thomas Pinfold Hawkins, of Birmingham, Warwick, manufacturer. A new or improved manufacture of wire chain.

2029. Richard Hill Norris, M.D., of Stafford-street, Birmingham, Warwick. Certain improvements in photography by the use of collodion in a dry condition, and for a means of transferring photographic films.

2030. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improved charger for shot-pouches. A communication.

2031. Edward Henry Cradock Monckton, of Chancery-lane, Middlesex. Improvements in blast-furnaces for smelting ores.

2032. Frederick Levick, junior, of Cwm Celyn and Blaina Iron Works, Monmouth, iron-master. Improvements in the construction and working of blast-furnaces for the smelting or making of iron.

Dated September 2, 1856.

2034. Maurice Aron, of Rue de l'Echiquier, Paris, France, gentleman. An improved leaven.

2035. Ambrose Archer, of Old Swan, near Liverpool, Lancaster, corn-factor. Improvements in the manufacture or preparing for use "founders' charcoal blacking," "coal-dust," "loam," and "facing sand."

2036. John Bate, of Birmingham, Warwick, gentleman. Improvements in folios, clips, or files for holding letters, invoices, and other documents.

2037. James Apperly, of Dudbridge, near Stroud, Gloucester, cloth-manufacturer. Certain improvements in the process of preparing cotton, wool, flax, and other fibrous substances for spinning, and in carding and preparing-machinery.

2038. Pierre Joseph Guyet, engineer, of Paris, France. An improved method of stopping or retarding railway carriages and trains, and of warming the interior thereof.

Dated September 3, 1856.

2039. George Cumming Thomas, of Washington City, United States of America. An improved method of making steel. A communication from H. Vaughan, of Providence, Rhode Island.

2040. Joseph Lamb, of Manchester, Lancaster, spindle and fly-maker. Certain improvements in machinery or apparatus for preparing, slubbing, and roving cotton and other fibrous substances.

2042. Samuel Hallen and Edward Hallen, both of Cornwall-road, Lambeth, Surrey. Improvements in rolling metallic substances.

2043. John Metcalf, of Newton Heath, near Manchester, Lancaster, manufacturing chemist. Improvements in the manufacture and treatment of tar-oil for dissolving India-rubber, gutta percha, gums, and gum-resins, and also in deodorizing all fabrics, wood, or any article impregnated with tar-oil or the products from coal-tar.

2044. Louis Cornides, of Trafalgar-square, Charing-cross, Middlesex. A new method of dressing or preparing hides, skins, intestines, and such like animal substances.

2045. Simon Ghidiglia and Louis Turletti, of Rue de l'Echiquier, Paris, France. An improved buckle.

2046. Edmund Pim Spiller, of Holborn-hill, London, manufacturer. Improvements in the construction of chamber-lamps.

2047. John Roberts, of Upnor, Kent, terra-cotta manufacturer. An improvement in the stoppering or closing of jars, bottles, and other vessels, applicable also to the joining of earthenware and other pipes.

2048. Jules Mozard, of Dufour-place, Golden-square, Middlesex. Improvements in the construction of miners' lamps.

Dated September 4, 1856.

2050. William Bishton, of Wolverhampton, Stafford, timber-merchant. An improvement or improvements in boats for inland navigation.

2051. John Morrison, of Birmingham, Warwick, machinist, and Samuel Amphlet, of Birmingham, manufacturer. A new or improved fastening for belts, bands, and other such like articles.

2052. Constant Jouffroy Duméry, of Paris, France, civil engineer. Improvements in steam engines.

2053. Joel Tanner Hart, of Lexington, Kentucky, America. Improvements in apparatus for modelling statuary from life, and for measuring and copying statuary and other uneven surfaces.

2054. Evan Leigh, of Manchester, Lancaster, mechanical engineer, and George Peter Leigh, of the same place, manager. Improvements in parts of machinery or apparatus used in preparing and spinning cotton and other fibrous substances.

2055. George Alfred Lewis, of Bristol, Somerset. Disconnecting and raising screw propellers.

2056. Eugene Armand Roy, John Archibald Hall, and William Thomas Binns, all of Camden Town, Middlesex. An improved means of insuring draught in smoke-flues or chimneys.

2057. William Keates, of Liverpool, Lancaster, copper and lead smelter. Improvements in the process of reducing copper to the metallic state from ores and other materials containing copper, and in the furnaces employed therein.

2058. George Anderson, of Queen's-road, Dalston, Middlesex, gas engineer. Improvements in the combustion of tar and other similar matters in heating gas retorts, and in the consumption of smoke arising therefrom, and from other fuels used therewith.

2059. John Montagu Hayes, of Southsea, Hampshire, captain R.N. An improvement in the construction of cartridges for fire-arms.

2060. William Moberly, of Ravenhead, near St. Helen's, Lancaster, gentleman. Improvements in the grinding and polishing of curved and rounded surfaces. Partly a communication.

2061. John Loude Tabberner, of Trafalgar-square, Charing-cross, Middlesex. Certain improvements in smelting ores.

2062. Benjamin O'Neale Stratford, Earl of Aldborough, of Stratford Lodge, Wicklow, Ireland. Improvements in aërial navigation and in the apparatus connected therewith, parts of which are applicable to locomotion generally.

2063. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in the construction of buildings and parts of buildings. A communication from Messrs. Charpentier, Brothers.

Dated September 5, 1856.

2064. John Benjamin Dancer, of Manchester, Lancaster, optician. Improvements in photographic cameras, and in the apparatus connected therewith.

2065. Henry Edward Cradock Monckton, of the Parthenon Club, Regent-street, Middlesex, and William Clark, of Upper-terrace, Islington, Middlesex. Improvements in machinery or apparatus for tilling or cultivating the soil.

2066. John Johnson, of Single-street, Mile-end, London, colour-manufacturer. Improvements in railway carriages.

2067. Alexis Eugene Duchatesu, of Paris, France. Improvements in stamp-presses and stamps used therewith.

2068. William Smith Mitchell, of Cornhill, London, and Charles Martin Ernest Gartner, of Lower Ashby-street, Northampton-square, Middlesex, watch-makers. Improvements in the construction of watches.

2069. Ralph Reeder, of Cincinnati, State of Ohio, United States of America. An improved universal dial and chronometer compass.

2070. Robert Wilson, of Patricroft, Lancaster, engineer. Improvements in valves, and in apparatus connected therewith.

2071. Thomas Burstall, of Southall, Middlesex, civil engineer. Certain improved machinery for manufacturing bricks and tiles from clay alone, or mixed with other materials.

2072. John Johnson, of Ohio, United States of America. Improvements in photographic plates. A communication.

2073. Charles Louis Frederick Helrigel, of Great James-street, Bedford-row, Middlesex. Improvements in lithographic printing-presses.

Dated September 6, 1856.

2075. Joseph Anelli, of Talbot Villas, Paddington, Middlesex. A crampon to prevent horses slipping in frosty weather.

2077. John Juckes, of Dame-street, Islington. Improvements in stoves or fire-places.

2078. Gustavus Palmer Harding, of Kingsland, Middlesex, warehouseman. Improvements in the manufacture of hats and other coverings for the head, and of parts thereof.

2079. Peter Wright, of Dudley, Worcester, anvil manufacturer. An improvement in the manufacture of anvils.

2080. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improved machinery for cutting round files. A communication.

2081. Charles Louis Lapito, of Faubourg Poissonier, manufacturer, Paris. A machine for manufacturing of mortar and concrete.

2082. William Wilkens, of Baltimore, State of Maryland, United States of America, manufacturer. Revolving cylinder battery or cannon, and apparatus connected therewith. A communication.

2083. Peter Armand Lecomte de Fontainemoreau, of Rue de l'Echiquier, Paris. Certain improvements in making artificial stone for statues and ornamenting purposes. A communication.

2084. Henri Etienne Trottier, of Rue de l'Echiquier, Paris, France, gentleman. An improved portable bath.

2085. Paul Rapsey Hodge, of Albion-grove, Islington, Middlesex, civil engineer. Improvements in grinding wheat and other farinaceous grains, and in the treatment of the products therefrom.

Dated September 8, 1856.

2086. Thomas Craig, of Glasgow, Lanark, N. B., paper-ruler. Improvements in ruling paper and other materials.

2087. Félix Estivant, of Paris, France. Improvements in casting metal tubes.

2088. Adolphe Gilbert Chalus, merchant, of Paris, France. Certain improvements in stopping bottles and other vessels.

2089. John Fowler, junior, of Havering, Essex. Improvements in machinery or apparatus for ploughing and tilling land by steam.

2090. Alfred Dalton, of Chester, iron-master. Improvements in smelting iron-stones and ores, and in furnaces used for that purpose.

2091. Robert Bamford, of Preston, Lancaster, manager. Improvements in looms for weaving.

2093. Francis Mitchell Herring, of Basinghall-street, London, manufacturer. Improvements in applying magnetic action to combs and brushes.

2094. Thomas Restell, of New Kent-road, Surrey, chronometer-maker. Improvements in breech-loading fire-arms and ordnance.

2095. William Petrie, of Woolwich, Kent, civil engineer. Improvements in the manufacture of sulphuric acid and the apparatus employed therein, parts of which improvements are applicable to the manufacture of nitric, hydrochloric, and other acids.

2096. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improved machinery for cutting India-rubber and other substances into threads or narrow strips. A communication from H. Davenport, of New York, United States of America.

Dated September 9, 1856.

2098. William Pidding, of Trinity-terrace, Southwark, Surrey, gentleman. Improvements in the preparation and manufacture of certain piled, corded, or other fabrics.

2100. William Gossage, of Widnes, Lancaster, chemist. Improvements in the manufacture of certain kinds of soap.

2102. Charles Brook, jun., of Meltham Mills, near Huddersfield, York. An improvement in polishing or finishing yarns, threads, and woven fabrics.

PATENT FILED WITH COMPLETE SPECIFICATION.

2131. Constant Jouffroy Duméry, of Paris, France, civil engineer. Improvements in apparatus for counting, registering, and indicating the distance travelled by vehicles, and the speed and time of travelling. Dated 11th September, 1856.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," September 23rd, 1856.)

1131. H. Bragg, jun. Improvements in machinery or apparatus for finishing linen and other fabrics.

1132. W. Galloway and J. Galloway. Improvements in machinery for rasping, cutting, and chipping dye woods.

1138. U. Scott. Improvements in public carriages and various parts of the same, which parts may be used separately and applied to vehicles of any description.

1141. C. H. Olivier. Improvements in the mode of preparing and applying silk waste. A communication.

1146. J. Cox. Improvements in coke and coke-ovens.

1148. W. Norris and R. King. Improvements in anchors.

1151. R. Foulds and W. Bracewell. Certain improvements in power looms constructed on what is called the loose reed principle.

1153. C. R. Williams. A new or improved implement or apparatus for the cultivation of land.

1157. M. Townsend. Improvements in the manufacture of knitted fabrics.

1158. W. Smith. A new application of the syphon as an irrigator and a motive-power machine. A communication.

1160. J. Martin. Improvements in machinery for draining or partially drying certain descriptions of wheat and other grain.

1178. G. Carter. Improvements in the mode of propelling and steering vessels, and in the apparatus and machinery applicable thereto.

1180. J. Brown. New or improved machinery to be used in the manufacture of iron.

1194. A. V. Newton. An improved mode of preparing the double chlorides of aluminium and sodium, and aluminium and potassium. A communication.

1217. W. Galloway and J. Galloway. Improvements in steam boilers.

1218. A. Hubert. An improved apparatus for ventilating ships or vessels.

1220. W. R. Hodges. Improvements in machinery or apparatus for manufacturing loop-pile fabrics. A communication.

1225. G. Barruel. Improvements in treating cotton-seed.

1240. J. Dixon. Improvements in apparatus for measuring water and other liquids.

1242. J. De Cockkenifeck. An improved process and apparatus for preparing, refining, and filtering oils or fatty matters.

1244. W. Illingworth. Certain improvements in printing or colouring and glazing china, earthenware, or other ceramic manufactures, and in the machinery or apparatus connected therewith, and also improvements in the subsequent treatment of such manufactures.

1248. F. P. Dimpfel. Improvements in the construction of steam boilers and furnaces.

1251. A. A. Gaget. Improvements in bookbinding.

1260. S. Newington. A preparation for destroying the fly or aphis and other insects on hop and other plants.

1261. J. Roberts. Improvements in machinery for moulding bricks and tiles.

1263. J. Baird. A method of freeing the wool upon skins from burrs and other extraneous substances.

1269. F. P. Dimpfel. Improvements in constructing the permanent way of railroads.

1324. J. Briggs. Improvements in blocks and bricks for building.

1607. R. Martineau and B. Smith. Improvements in taps for drawing off liquids.

1636. S. M. Saxby. Improvements in ascertaining the errors of mariner's compasses.
1718. J. P. Fisher. Improvements in cues used at billiards, bagatelle, and other similar games.
1765. G. Spencer. Improvements in the couplings of feed pipes of locomotive steam engines and tenders. A communication.
1772. S. Jay and G. Smith. Improvements in stuffing or padding couches, cushions, bedding, chairs, and other similar articles.
1792. R. Thatcher. Certain improvements in preparing for doubling or spinning cotton or other fibrous substances.
1809. W. E. Newton. A new musical instrument to be played by the agency of steam or highly compressed air. A communication.
1815. T. Wicksteed. Improvements in separating sewage and other matters from water or fluid mixed therewith.
1935. E. Sutton. An improved construction of stereoscope.
1941. W. E. Newton. An improvements in valves for steam engines. A communication.
1952. J. Crossley and J. Bolton. Improvements in apparatus or means employed in the printing of yarns for carpets and other fabrics.
1973. J. Wadsworth. Improvements in the ventilation of mines, and in removing noxious gases or vapours from places in which they accumulate or are generated, and in machinery or apparatus applicable to and to be used for such purposes.
1977. W. Webb. An improvement in reclining chairs.
1988. E. A. Cowper. An improvement in the manufacture of candles.
2000. A. V. Newton. Improved machinery for combing fibrous substances. A communication.
2008. C. Heilmann. Improvements in furnaces of steam boilers.
2021. H. Conant. A new and useful improvement in fire-arms.
2023. J. Gregory. An improved fish-joint or method of connecting rails.
2038. P. J. Guyet. An improved method of stopping or retarding railway carriages and trains, and of warming the interior thereof.
2055. G. A. Lewis. Disconnecting and raising screw propellers.
2056. E. A. Roy, J. A. Hall, and W. T. Binns. An improved means of insuring draught in smoke-flues or chimneys.
2062. B. O'Neale Stratford, Earl of Aldborough. Improvements in aerial navigation and in the apparatus connected therewith, parts of which are applicable to locomotion generally.
2068. W. S. Mitchell and C. M. E. Gartner. Improvements in the construction of watches.
2070. R. Wilson. Improvements in valves, and in apparatus connected therewith.
2100. W. Gossage. Improvements in the manufacture of certain kinds of soap.

Opposition can be entered to the granting of a Patent to any of the parties in the above List; who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

2152. David Mushet.
2154. Henry Meyer.
2167. Henry Constantine Jennings.
2169. Richard Archibald Brooman.
2181. Ferdinand Potts.
2188. Alfred Vincent Newton.
2190. James Baldwin.
2192. Peter Rothwell Arrowsmith and James Newhouse.
2227. Jean Alexandre Lebat.
2235. Peter Armand Lecomte de Fontainemoreau.
2239. Robert Brisco and Peter Swires Horsman.
2241. Caleb Bloomer.
2255. William Joseph Thompson.

LIST OF SEALED PATENTS.

Sealed September 17, 1856.

640. Peter Armand Lecomte de Fontainemoreau.
645. John Drury.

Sealed September 19, 1856.

651. Richard Morgan.
670. William Drummond.
671. James Murphy.
673. William Brierley and James Platts Brierley.
674. Walter Glover.
675. Henry Pratt.
689. Henry Brierley.
690. Thomas Heaton.
745. Joseph Webber.
756. John James Rippon.
768. Charles Durand Gardissal.
772. Henry Henderson.
790. Frederic Grice.
811. James Bannehr.
843. William Terry.
876. Robert Stirling Newall.
1226. Robert Bell.
1290. Henry Bessemer.
1322. Montague Richard Leverson.
1348. Robert Harlow.
1405. William Jacot.
1424. Joseph Davis.
1473. Henry Hussey Vivian, Bernhardt Gustav Hermann, and William Morgan.
1474. George Dyson.
1529. Thomas Frederick Henley.
1547. John Hay and James Hay.
1578. Joseph Lewtas and John Humphreys.
1623. Alexander William Williamson.
1638. Robert Harrington.
1648. John Pope.
1676. Duncan Cameron.
1733. Sven Johan Agrell Burg.

Sealed September 23, 1856.

694. Peter Brown and George Brown.
695. Richard Husband.
696. John Tysoe, Charles Tysoe, and Peter Foxcroft.
711. William Ball.
712. Robert Collins.
721. David Lowe.
747. James Harrison.
749. James Harrison.
755. Francis Puls.
763. William Nimmo.
799. Alfred Vincent Newton.
791. Frances Young.
801. James Samuel and John Nicholson.
827. Julian Bernard.
1317. Joseph Bauzemont.
1509. Joseph James Foot.
1613. Sewall Short.
1693. John Cowley.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
Aug. 27	3870	Price's Patent Candle Company	Vauxhall	Candle-lamp.
Sept. 1	3871	J. Broad	Wolverhampton	Nail and corn-trimmer.
5	3872	G. P. Cooper	Walworth	Shirt-collar.
13	3873	J. J. Welch and J. S. Margetson	Cheapside	Shirt.
15	3874	Wilcox and Co.	Mill-wall Potterics	Pedestal-urinal.
,,	3875	T. Green	Cosely, near Bilston	Camp-oven, &c.
17	3876	Spilsbury and Downes.	Cheapside	Dress-fastening.
,,	3877	H. R. Freeborn	Manchester	Improved Shirt.
18	3878	B. Benjamin	Regent-street	Oude wrapper.
20	3879	H. L. Burton	Islington	Carriage-frame and wheel-guard.

PROVISIONAL REGISTRATIONS.

Aug. 27	796	J. Homer	Rock Ferry, Cheshire	Non-attractive compass.
Sept. 2	797	G. Kings	Moseley, Worcestershire	Caving-sieve.
15	798	R. Ramsey	Lancaster	Tallow-cup.
19	799	D. Pickering	Birmingham	Candle-dipping and weighing-machine.

NOTICES TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine*, must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

The Replies of *A Looker-on* and *A Patient Reader* to Mr. Good's note on the Moon's Motion, and the letter of *F. P.* on Arches, stand over till next week for want of space.

J. A. D.—Your letter on Weighing Cranes has been received, and will probably be published.

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- Statham ..... Electric Telegraphs 304
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- Beasley ..... Rifling Fire-arms 304
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- Samain ..... Portable Furniture 304
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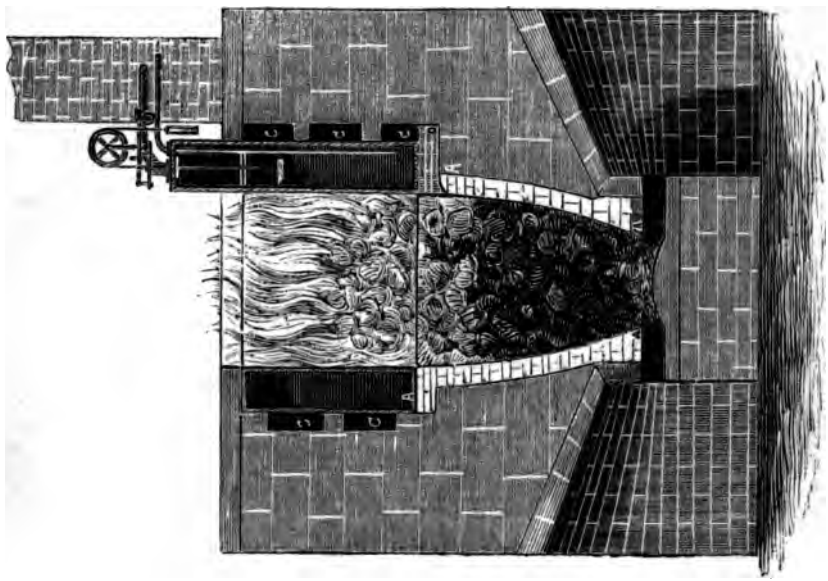
London: Archibald Brecman, of No. 166, Fleet-street, and 26, Rue Vivienne, Paris; Hodges and Smith,

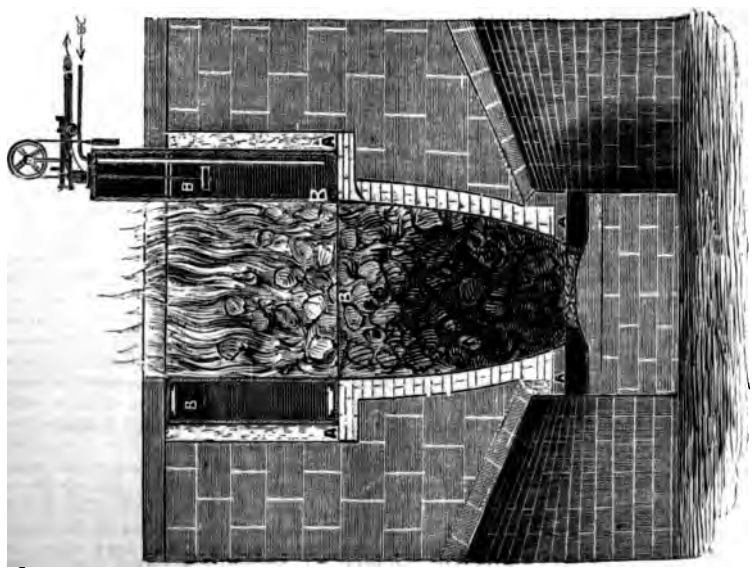
Mechanics' Magazine.

No. 1730.] SATURDAY, OCTOBER 4, 1856. [PRICE 3D.

Edited by R. A. Brooman, 166, Fleet-street.

WEBBER'S IMPROVEMENTS IN GENERATING STEAM.



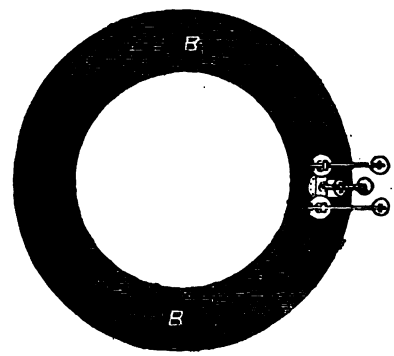


WEBBER'S IMPROVEMENTS IN GENERATING STEAM.

MR. JOSEPH WEBBER, of Torquay, has introduced and patented a method of generating steam by means of the heat generated in the burning of lime, chalk, and cement, which heat is ordinarily wasted. He places an annular boiler round that part of a kiln where there is the greatest amount of heat, as shown in the accompanying engravings, in which fig. 1 is a sectional elevation of a kiln fitted with a steam boiler, and fig. 2 is a plan. A A is the brickwork of the kiln: B B an annular boiler. Between the outside of the boiler and the kiln is a lining of any suitable non-conducting material, or, instead of this lining, a flue, C C, as shown in fig. 3, may be carried round the outside of the boiler; but in such case, coal or wood must be used to burn the lime, and fire must always be kept below the passage, D, leading into the flue; or the top of the kiln must be entirely closed when burning is going on.

Various forms and arrangements of kilns may be employed, and different materials may be used as fuel to burn the lime and similar materials with. The above simply shows, by way of exemplification, one way in which the invention may be carried into effect.

Fig. 2.



THE VULCANIZATION OF INDIA RUBBER.

No. IV.

MR. CHARLES GOODYEAR, in an unpublished work upon this subject, states that the first pair of India-rubber over-shoes were made by himself and daughter, in a cellar, in New York. There are now millions of them made each year at the various India-rubber mills throughout America, France, and Belgium. But a singular desire to appreciate and follow sequences, and an indomitable perseverance in conquering difficulties, appear to have acted upon the industrious mind of Mr. Goodyear, in this direction, with peculiar force. The India-rubber over-shoe perfected, Mr. Goodyear did not sit down quietly to contemplate his work, even when apparently complete, but strongly convinced that there was more to do than covering the feet of nations with a waterproof substance, however symmetrical in its form and comfortable in its fit under almost every circumstance, he felt that if the leather boot or shoe could be altogether dispensed with, and there could be substituted for it an India-rubber boot or shoe, which should, while resisting wet from without, suffer the perspiration of the foot to escape, a boon of priceless worth would be conferred upon *humanity, the more* so as the item of boots and shoes to a poor family, or even to a person of moderate means, was one of considerable importance.

To reduce the cost of this article of clothing, and to give to the poor man a pair of boots at one-third of the present expense, and not as now, at more than one-half of his week's wages, has been one of the special objects of Mr. Goodyear's untiring life. That he will succeed in this there now exists not a shadow of doubt. The combinations of the hard, the semi-hard, and the soft vulcanised India-rubber, have given him all the needful elements of success, and ere long boots and shoes of India-rubber, which need not a morsel of leather for their formation, will be as plentiful as over-shoes are now, and even more so. The power of the hard, the semi-hard, and the soft vulcanised India-rubber to resist wear is one of their extraordinary features. Heels, for instance, made of the soft material have been put on to the boots of boys, at the united parish school at Norwood, and on to the toes of the same boots iron tips of the eighth of an inch have been secured. The result of this test has been that the iron has been worn out, and the heel when removed and weighed has

scarcely suffered the slightest appreciable difference in weight or density.

Mr. Goodyear has already made arrangements to disperse heels of this material, by the hogshead. He fashions them in a circular form, making the outer margin of the hard material and the inner circle of the soft. The hard material is smooth and beautifully polished. It does not require blacking, and will keep its lustre for a long time. The centre bulb projects beyond the surface of the hard ring, and when trodden upon yields and is flattened by the weight of the body.

One of the applications of this form of heel bears directly upon the perfectibility of a boot or shoe wholly made of India rubber. In the first place, the rotary principle of heel is employed, which one might suppose almost an unnecessary arrangement, and in the next the peculiar form of the bulb or lobe acts when pressed upon as a valve or air pump, and sends at every step, into those shoes or boots properly prepared, a certain amount of air; or perhaps it would be more correct to say it displaces a certain amount of air which finds renewal from other parts of the boot.

Is a boot thus made unsightly? not in the least. They are really elegant in form and general contour. Our readers are familiar with the corrugated japanned dress boots. The India-rubber boots we have seen closely imitated these, but, it may be added, that in thus copying, Mr. Goodyear but copies his own, as the corrugated dress boot was introduced more to prepare the eye for what was to follow than to give the *beau* of New York, of Paris, and of London any particular style of dress boot. In this, Mr. Goodyear displays a consummate knowledge of human nature. Had he brought out a corrugated boot, without this *avant courier* and child of fashion, his invention might have possessed very essential recommendations, but that of "optical familiarity" and the work of years would have been as nought.

We may mention here a characteristic of Mr. Goodyear's inventive genius. He considers failures as stepping stones to success. He tells one of the many well-selected *aids* by whom he is surrounded, to do such and such a thing. The mechanician returns, after giving his earnest attention to the task, with a something so clumsy or so ridiculous that it either raises the fear of censure or the dread of laughter as the reward of his pains; but neither laughter nor censure await him. The result is just what its originator expected—the practical application confirms his views. A dozen failures, perhaps fifty, perhaps two hundred, wait upon these efforts, but with this valuable difference, that each failure approaches, directly or indirectly, the something that the mind desires to arrive at. Thus, each thing is, as it were, hemmed in, it is check-mated by these far-seeing moves; and science—the antagonist in this noble game—renders up the *coveted* object of an intellectual struggle. In a word, it is a practical exercise of inductive philosophy, or the algebra of mechanics getting at positive and useful facts, by means mysterious and unintelligible to ordinary comprehensions.

The electric character of some of the divisions of vulcanite, and the non-electric character of others, urgently demand the consideration of electricians. For instance, a man standing in India rubber over-shoes may play with impunity with charged electric apparatus; but if he throw these shoes off by chance, and attempt the same coquetry with the machine, he will find himself both shocked and surprised. A person, therefore, standing in India-rubber shoes is perfectly insulated, and the same consequence must result, if not wholly, in greater part, to those who wear the shoes with the lobes or bulbs of vulcanised India-rubber. It is said that some persons feel a perceptible irritation of the skin when wearing this kind of shoe; that others experience sensations of comfort; while a third class are not aware of any change. These facts being beyond dispute, they are thrown out here for the solution of those who have time, inclination, and talents to pursue the inquiry. The lobes of the boot and shoe about to be introduced are somewhat like those of the feet of a cat. Indeed, they resemble the appendages of the feline foot in many respects, and the consequence may in some measure be the same. Those naturalists to whom we have spoken on the subject attempt to refute all endeavours to show similarity of consequences, more particularly that of electric influence. They urge that the lobes of a cat are placed by Providence upon the foot to permit of its advancing without noise upon its prey, and here they stop. But we are disposed to go farther, and, while admitting this, to add that as a cat is nearly the most, if not the most, electric of animals, these lobes are insulators, and play a very important part in the animal's economy. The animal vitality, so to speak, in other words, the quantity of electric fluid in a cat, is notorious. We have but to take it into a dark room, and rub the fur backwards, to convince us of this. Their very vitality has gained for them the distinction of having nine lives, and the necessity of killing a cat, if it is not scientifically done, is attended with the most painful and revolting exercises of perseverance. Yet, if its spinal cord be struck,

or the sharp tooth of a dog enter there, a death more instantaneous than perhaps any other animal suffers under like circumstances is the result. The vital current is severed, and life becomes extinct.

These remarks may be open to confutation or modification. We throw them out freely, as of great consequence at this stage of our task. We could wish to hear that men of gifted minds had become impressed with their importance, and were engaged in the pursuit of the truth. Under them, we are confidently impressed, there lies an immense amount of new and useful matter. Let the subject have a fair and dispassionate investigation, divested of even the slightest taint of quackery. Let the resources of known laws be brought to bear upon it, and let the practical and well-digested experiments of men who lean neither to shallow conclusions nor to empiricism, be given to the light.

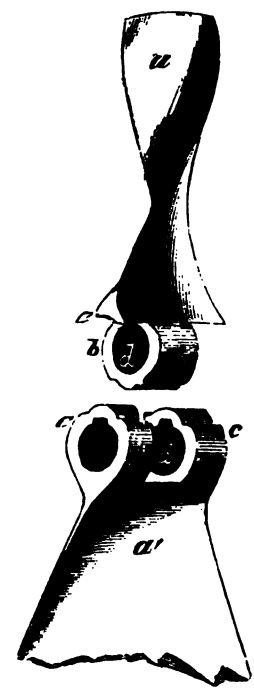
Mr. Goodyear seems to be prepared to meet any failure in the perfect ventilation of the corrugated boot or shoe by an arrangement as novel as it is original. He has learned from experience that holes in a polished surface may be so fine as not to admit of water penetrating them, and at certain distances he punches a minute hole upon the top of the arc of the corrugation. But we are inclined to believe that when the free admission of air is allowed to circulate under and over the foot (the latter by the means of these corrugations which no stocking could wholly fill and choke up), the necessity for holes at all, or if at all, one or two where, if a shoe, a tie might be introduced, would alone be needed.

LYNN'S PATENT SCREW PROPELLERS.

Mr. W. Lynn, the Assistant Inspector of Machinery at the Royal Dockyard, Portsmouth, has taken out a patent for a mode of constructing the blades of screw propellers, by which they may be separately fitted on to or removed from the shaft, for the purpose of being replaced in case of damage or from any other cause, and so that spare screws can be more conveniently stored or carried on board of ship.

Instead of casting the blades of the screw together with the boss and shaft, or, as is frequently done, casting them solid with the boss, the eye of the screw being afterwards bored and fitted on the shaft, Mr. Lynn's improvement consists in casting the blades separately, with a portion only of the length of the boss or eye cast therewith, and afterwards fitting the parts of the boss together *in such a manner as to secure them to the shaft, and form a solid screw when keyed up* or fixed by collars. Thus, for instance, in applying the invention to a double-bladed screw, the boss is formed in the manner of jointing hinges, viz., with a knuckle joint, as shown in the accompanying engraving, the boss being divided in its length into, say, four parts. The male portion is formed in the middle of the boss of one blade, and is about two-fourths of the whole; whilst the other blade has the female portions of the boss divided into two lugs or cheeks, each of about one-fourth, the male and female portions of the boss being accurately fitted together. The eye is made to receive the screw-shaft or T-headed piece of shaft, upon which it is fitted, and may be secured by means of a feather.

In the engraving, *a* is the one blade having the single knuckle or male portion of the joint, *b*; *a'* is the corresponding blade, having the double knuckle or female portion



of the joint, *c c*; *d*, the eye or hole through the boss of the screw blades; *e*, the shoulder of the single knuckle or male portion of the joint or boss, and which abuts on and forms a stop into the recess formed upon the top sides of the double knuckles or female portions of joint or boss.

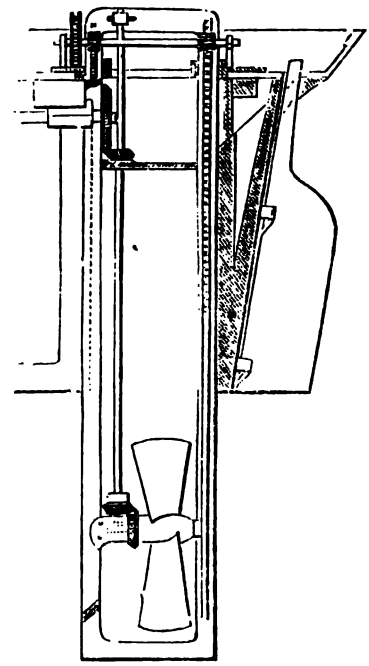
However useful the above arrangement may be, we are bound to state that Mr. Lynn

has been preceded in the invention of the principal feature of it (as may be seen on reference to the *Mech. Mag.*, vol. lix., page 188) by Mr. Alexander Moore, foreman of shipwrights in Devonport Dockyard, who, in 1853, received a bronze medal from the Royal Cornwall Polytechnic Society, for the invention of a screw propeller composed of two similar parts, which dovetail together at the boss. Mr. Moore's improvement was designed for the purposes mentioned by Mr. Lynn, and differs from his only in the mode of fitting and combining the separate blades. We mention these facts simply that it may be understood in how far Mr. Lynn's invention is novel. Mr. Lynn makes no claim to the details of Mr. Moore's arrangement.

We have only further to repeat what we remarked in our notice of Mr. Moore's invention, viz., that while acknowledging the existence of important advantages, we are afraid that a suspected deficiency of strength will operate against the general adoption of the improvement.

NAPIER AND MILLER'S IMPROVEMENTS IN DRIVING SCREW-PROPELLERS.

Messrs. G. Napier and J. Miller, engineers, of Glasgow, have recently patented a method of fitting screw propellers so that they may be lowered below or raised above the level of the keel while in action. That any advantages at all to be compared with the inseparable disadvantages are to be derived from their arrangements, we strongly doubt. The annexed engraving illustrates the method they adopt. They place the propeller on a short shaft mounted in a sliding frame, by preference in the dead wood, in which it has bearings down to the keel; a portion of the dead wood and rudder, or stern post, supports the sliding frame in the rear, while it is similarly supported by the dead wood and stern post in front. This propeller frame slides in a vertical direction, and comes up through the deck. A vertical driving shaft is fitted to this sliding frame, and moves up and down therewith, the propeller shaft being actuated by bevel gear. The vertical shaft in the sliding frame receives motion through bevel wheels, one of which is fitted to the shaft, which slides through it freely to permit of the rising or lowering motion of the propeller frame, while at the same time transmitting the rotary motion; the other wheel is fitted to the shaft communicating with the engine or other driving power. The sliding propeller frame may be fitted with rack and pinion gear for the purposes of elevation and depression, and in order to



render that more easy to be accomplished, the whole weight may be suitably counterbalanced.

THE GRANULATION OF IRON IN WATER.

Since the publication of our last number, we have received a communication respecting the invention of Capt. Uchatius, according to which molten iron is granulated and prepared for the manufacture of cast steel. In this communication it is stated that the cast steel thus produced has now been used for a year and a half in the Vienna Arsenal, for every description of tools required, where, previously, only the finest quality of English tool steel (Huntsman's) was used. Also that, in the early part of the present year, a commission of scientific officers was instituted in Paris, by command of the Emperor Napoleon, to inquire into the merits of the Uchatius' process of making cast steel, and a very favourable report of the results of the inquiries was issued by the Commission, and published in all the French and most German scientific journals in May last. Shortly following these experiments a French

company was formed for the purpose of manufacturing steel after M. Uchatius' plan, and the French patent was purchased of the inventor for a very large sum; and since then negotiations have been entered on for the transfer of the German and Belgian patents, and approach their conclusion. Mr. C. Lenz (of 124, Fenchurch-street) intends in the course of a few days to make further trials in London, for the satisfaction of gentlemen interested in the process.

In alluding to this process Mr. David Mushet, in last week's *Mining Journal*, says, "It is a singular instance of the frequency with which matters as old as the hills are re-patented, that the process of granulation in water, for which M. Uchatius, in your last Journal, claims priority over Mr. Bessemer, was one of the varieties of treatment used at Cyfarthfa (many years since) for this cupola finers' metal. But it was no part of the patent, *such granulation being notoriously old.* This process of refining was also introduced at Mr. Attwood's works at Corngreaves, and very profitably carried on for some time. I presume there was some extra trouble incurred, which led to its discontinuance."

Mr. Mushet and probably many others, will consider it a curious fact that Mr. William Clay, of Liverpool, filed only last week a specification of a patent from which the following is an extract:—In this invention "the granulation of the iron is effected by causing the metal, when in a molten state, to run into water, after which the iron may be collected in a granular form, and be subsequently worked up by the ordinary processes into bars or other forms of wrought iron.

"Instead of simply granulating the iron, and obtaining cast iron or refined metal in the granular form, as above mentioned, the metal may also at the same time be decarbonized, or be deprived of a portion of its carbon, by causing the cast iron, when in a melted state, to fall from a height through the air before reaching the water."

THOMPSON'S IMPROVED SKATES.

Messrs. Parker and Thompson, of Sheffield, have introduced an improvement in the form of skates, the invention of the latter gentleman, which greatly reduces the cost of manufacture. The invention consists in providing large surfaces for the support of the heel and ball of the foot, by which means the body of the skate may be formed of a straight piece.

The inventor makes two apertures, with narrow necks, in the upper part of the skate-iron, and inserts therein the heads of two screws, made with square shoulders; the narrow necks of the apertures prevent the screw heads from being drawn through them. He fits the upper edge of the skate iron in a longitudinal groove, formed along the bottom of the piece of which the body of the skate is composed, and passes the screws through holes made in the body of the skate. He sinks or hollows out the upper part of the body around the parts where the two screws are inserted, and mounts or screws upon each of the said screws, a circular or other conveniently-shaped piece, or plate, which form the bearing surfaces or rests for the heel and ball of the foot.

The annexed engravings illustrate the manner in which he carries his invention into effect: fig. 1 is a longitudinal section of a skate constructed according to his improvement; and fig. 2 is a plan of the same. A is the body of the skate, composed of a straight piece of wood, or other suitable material; B is the skate-iron, the upper edge of which is fitted into a groove formed

Fig. 1.

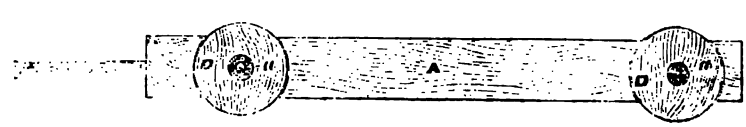


Fig. 2.

along the bottom of the body, A; C C are screws, which fix the body and iron to-

gether; the heads of these screws are sunk in apertures formed in the upper part of the skate-iron. These apertures are made with narrow necks, to prevent the screws from being drawn through them. The shanks of the screws pass through orifices in the body, A. D D are plates (here shown as circular) screwed down upon the screws, C C, into seats or hollows made to receive them in the body of the skate, A. These plates, D D, are the bearing surfaces or supports for the heel and ball of the foot. They may be made of wood, sheet iron, or other suitable material. *a a* are metal nuts, fitting on the screws over the plates, D D. These nuts are not absolutely necessary, but skates will be more secure with them. *b b* are slots in the body, A, for holding the straps by which the skate is attached to the foot of the wearer. Metallic eyelets are fixed into the holes made in these straps for the reception of the tongue of the buckle.

Instead of employing circular pieces to support the heel and ball as at D D, figs. 1 and 2, the inventor sometimes uses for the purpose sheet-iron plates, which he screws on to the body of the skate by screws which hold the skate iron and body together. The heads of the screws are sunk in apertures in the upper part of the iron. The improved skates have been patented.

THE COST OF GAS.

In the Report of the General Gas Committee to the Council of Salford on a proposed reduction in the price of gas in that borough, the following statement, which will be of great value to gas companies and consumers generally, is furnished.

Statement showing the Maximum and Minimum Charges for Gas and the Materials used in Twenty Towns in the Neighbourhood of Salford.

Name of Town.	Maximum charge per 1,000 feet.		Minimum charge per 1,000 feet.		Extent of Minimum Scale in Feet.	Material Used.
	s.	*d.*	*s.*	*d.*		
Accrington	4	6	3	6	.....	Half cannel and half coal.
Bacup	5	9	5	3	225,000 feet per quarter.	Half cannel and half coal.
Blackburn	4	0	3	9	200,000 feet per quarter.	Boghead cannel and coal.
Bolton	4	6	4	0	.....	No return.
Burnley	3	6	3	6	.....	All coal.
Bury	5	0	4	3	800,000 feet per annum.	1-3rd coal 2-3rds cannel.
Chorley	4	6	3	6	.....	Half coal and half cannel.
Dukinfield	4	6	3	2	£500 per an., 30 per cent. dis.	All coal.
Heywood.....	5	0	3	9	£250 per an., 25 per cent. dis.	Coal and cannel.
Liverpool	4	0	4	0	.....	All cannel.
Macclesfield ..	4	6	3	9	250,000 feet half yearly.	Coal and part cannel.
Manchester....	5	0	4	0	5,000,000 feet per annum.	Cannel.
Oldham	4	6	3	4	1,000,000 feet per annum.	All coal.
Preston	4	9½	3	4½	2,000,000 ft. p. an., 30 p. cent dis.	Cannel, part coal.
Rochdale.....	4	0	3	3	800,000 feet per annum.	2-3rds cannel 1-3rd coal.
Radcliffe.....	5	6	4	3	800,000 feet per annum.	3-5ths coal 2-5ths cannel.
St. Helens	5	0	5	0	.....	Half cannel and half coal.
Staley Bridge..	4	6	3	2	£500 per an., 30 per cent. disct.	Coal and cannel.
Stockport	5	0	4	0	£230 per quart. 20 per cent. dis.	Cannel, 1-4th coal.
Warrington....	4	6	4	6	.....	All coal.
	92	6½	77	3½		
Aver. of 20 towns	4	7½	3	10½		
Salford.....	5	0	4	6	200,000 feet per quarter.	All cannel.
Ditto proposed Scale	4	6	4	0	200,000 feet per quarter.	All cannel.

In directing attention to the return, the Committee remark that gas made entirely from Wigan cannel, as in Salford, has a much greater illuminating power than the gas made from coal.

IMPROVEMENTS IN TANNING SKINS AND HIDES.

A very important improvement in the process by which skins and hides are tanned, has recently been introduced. It is the invention of Mr. Funcke, a practical tanner and currier, of Herdecke, Westphalia, who has obtained a patent for it in this country.

It consists in expediting the introduction of tannic acid into the interior of skins and hides, by counteracting a too rapid action of the tannic acid upon the surface only of the skins and hides, which thereby would be hardened. The mode of operation adopted is as follows: — 1. The unhaired skins or hides are passed through water in which soda of commerce has been dissolved, and are then hung up and allowed to become nearly dry before the actual tanning process is proceeded with. 2. Diluted vegetable acids are added to extracts of bark or other vegetable substances containing tannic acid, and the skins or hides are subjected to the action of the combined liquids, by being steeped therein, by which the pores of the skins and hides are opened and extended, at the same time as they are exposed to the action of the tannic acid. 3. The skins and hides are again subjected to the action of a liquid similar to the last, by steeping them therein; but in this case vegetable acid, somewhat stronger than the former, is taken, and its action is softened by the addition of a solution of sugar. 4. While the skins and hides are subjected to well-known mechanical lifting and falling action, they are subjected to the action of a liquid containing tannic acid, until the leather is finished; but as the tanning liquor in this process, in order to act with expedition, is of such strength as to give to the leather a colour too deep for most purposes, the colour is reduced when required by some sulphuric acid, salt being added, in this last stage of the process, to the tanning liquid in which the skins and hides are worked.

VICTORIAN DECIMAL SYSTEM.

A SYNOPSIS OF VICTORIAN AND FRENCH DECIMAL MEASURES AND WEIGHTS.

Measures of Length.

Tek	0·032	Millimetres.
Fil	0·32	,,
Aet	3·2	,,
Enk	3·2	Centimetres.
Ped	3·2	Decimetres.
Rod	3·2	Metres.
Chane	3·2	Decametres.
Kord	3·2	Hectometres.
Leeg	3·2	Kilometres.
Voy	3·2	Myriametres.

Rod=3·1749456 Metres.

Millimetre	3·15	Fils.
Centimetre	3·15	Aets.
Decimetre.....	3·15	Enks.
Metre.....	3·15	Peds.
Decametre	3·15	Rods.
Hectometre	3·15	Chanes.
Kilometre.....	3·15	Kords.
Myriametre	3·15	Leegs.
,, ..	0·31	Voys.

Metre=3·1496632 Peds.

Measures of Surface.

Chek	0·01	Milliare.
Prode.....	0·1	,,
Tave	1·01	,,
Lit.....	1·01	Centiare.
Slade.....	1·01	Deciare.
Aer	1·01	Are.
Rood.....	1·01	Decare.
Morg.....	1·01	Hectare.
Kide	1·01	Kiloare.
Brale.....	1·01	Myriare.

Aer=1·008026 Ares.

Milliare.....	0·992	Tave.
Centiare	0·992	Lit.
Deciare.....	0·992	Slade.
Are	0.992	Aer.
Decare	0·992	Rood.
Hectare.....	0·992	Morg.
Kiloare.....	0·992	Kide.
Myriare.....	0·992	Brale.

Are=0·9920378 Aers.

Measures of Capacity and Solidity.

Goot	0·03	Millilitres.
Crist	0·32	,,
Rame	3·2	,,
Flone.....	3·2	Centilitres.
Horn.....	3·2	Decilitres.
Galon	3·2	Litres.
Ferken	3·2	Decalitres.
Ponchen	3·2	Hectolitres.
Last	3·2	Steres.
Ploat	3·2	Decasteres.

Galon=3·20042488 Litres.

Millilitre	3·125	Crists.
Centilitre	3·125	Rames.
Decilitre	3·125	Flones.
Litre	3·125	Horns.
Decalitre	3·125	Galons.
Hectolitre.....	3·125	Ferkens.
Kilolitre	3·125	Ponchens.
Stere	,,	,,
Decastere.....	3·125	Lasts.
Hectostere	3·125	Ploats.

Litre=3·1245851 Horns.

Measures of Weight.

Cule	3·2	Milligrammes.
Grane	3·2	Centigrammes.
Fave	3·2	Decigrammes.
Drame	3·2	Grammes.
Ounze	3·2	Decagrammes.
Libe	3·2	Hectogrammes.
Clove	3·2	Kilogrammes.
Heke	3·2	Myriagrammes.
Taf	3·2	Quintals.
Stol	3·2	Milliers.

Drame=3·1948892 Grammes.

Milligramme ..	3·13	Decicules.
Centigramme ..	3·13	Cules.
Decigramme	3·13	Granes.
Gramme	3·13	Faves.
Decagramme ..	3·13	Drames.
Hectogramme ..	3·13	Ounzes.
Kilogramme	3·13	Libes.
Myriagramme ..	3·13	Cloves.
Quintal	3·13	Hekes.
Millier	3·13	Tafs.
„	0·31	Stol.

Gramme=3·1299989 Faves.

RANGE OF THE VICTORIAN AND FRENCH SYSTEMS, WHEN USED FOR SCIENTIFIC PURPOSES.

Millitek=0·00003 Millimetres.
Myriavoy=3200 Myriametres.

Millimetre=3150 Milliteks.
Myriametre=0·00003 Myriavoys.

Millichek=0·00001 Milliare.
Kilobrale=1010 Kiloares.

Milliare=99200 Millicheks.
Kiloare=0·0001 Kilobrale.

Milligoot=0·00003 Millilitres.
Kiloploat=32 Kilosteres.

Millilitre=31250 Milligoots.
Kilostere=0·03 Kiloploats.

Millicule=0·003 Milligrammes.
Kilostol=3200 Milliers.

Milligramme=313 Millicules.
Millier=0·00003 Kilostol.

Kilostol=3194889 Kilogrammes.

On looking at the tables given above, and in the Number 1728 of the Magazine, a person might be struck with the number of denominations there given; but it must be borne in mind that they are intended for each class of traders to use only so much as they may require. Chemists, druggists, and bullion dealers, may use the smaller denominations of weights; other traders may go a little higher in the scale, wholesale dealers higher still, and the upper part of the scale may serve for statistical purposes, where large quantities may be expressed with few figures. People may use just as small a part of the scale as may suit their particular transactions. They are no more required to use the whole scale than a singer is expected to sing through half-a-dozen octaves. When the poor and illiterate, after nine days use, have got to know something of the ounze and libe, they need trouble themselves no more about the rest than they please. The rising generation may have plenty of time to learn the whole between the passing of a law, to make it legal, and its coming into operation. As to burthening the memory, what are forty or fifty new words, instead of twice or three times as many, in a language of which they must learn tens of thousands? There is nothing children learn more readily than a sequence of articulate sounds. Every urchin learns to repeat his alphabet long before he knows the letters by sight. The largeness of the scale, besides being more extensively useful amongst so many callings, gives greater facility in mental calculations. Suppose a granary floor 200 peds long, 100 wide, covered with grain to the depth of 5 peds, how many lasts, ponchens, or ferkens will there be? 200 long and 5 deep=100 long and 10 deep; every ten of length gives 10 ploats across, we shall therefore have 100 ploats, 1,000 lasts, 10,000 ponchens, 100,000 ferkens. The largeness of the ploat enables us to dispense with large numbers at the commencement of our operations. A French writer says France produces 80,000,000 hectolitres of corn annually =24,997 ploats or 25,000—three figures less; and mentally we can find that a box 25 leegs long, 10 peds deep and wide, placed in the middle of France, would hold all the corn grown all round it in the country. We thus easily obtain some idea of the quantity, but who can *realise* 80,000,000 hectolitres? A waterfall of 100 peds is 100 peds wide, 10 deep, and runs at the rate of 1,000 peds per minute, what is the measure, and weight, passing per minute, and what power would be required to pump it back again? 10 rods wide one deep and one long=10 ploats; 1,000 peds =100 rods long, therefore 1,000 ploats, 10,000 lasts, and 10,000 stols. It falls 100 peds = a chain; 10,000 chastols of work, and power, 100,000 rostols, 200,000 horses. In round numbers, the national debt is £800,000,000, and gold is 20 times heavier than water, what would be the size of a piece of gold to pay it? A ferken of water weighs 4,000 sovereigns, a ploat contains 1,000 ferkens, and therefore weighs 4,000,000. Gold is 20 times heavier, therefore a ploat of gold weighs 80,000,000 and 10 ploats would pay 800,000,000. A piece of gold 10 ft. 5 ins.

square and 104 ft. 2 ins. long, present measures.

Take a charity-school boy, knowing the first four rules of arithmetic, and teach him the Victorian vocabulary, give him a little time to *feel his way*, and then pit against him a first wrangler to work similar questions with the present methods; and the boy will finish his task, and then go spin his top, or fly his kite, while his antagonist "sups his porridge with a knitting needle."

In my next I propose to show the utter worthlessness of the present much vaunted decimal system of France. Not from a spirit of rivalry or opposition, but from a firmly grounded belief of its entire unfitness for a country, where time is an object, and patience is not unlimited.

There are many gentlemen in this country of the highest respectability, and of deservedly world-wide reputation for talent, who appear to look upon the French system as the perfection of human wisdom; and I am willing to admit that it is exceedingly philosophical, and as full of Greek and Latin as it could be crammed. If it had been as practical as it is philosophical, and as vulgar as it is classical, it would have been generally adopted in France without a fifty years' struggle, backed with such power as could never be brought to bear on such a system in England. It is not generally adopted in France, *and never can be*. It will have to be abandoned altogether and a commencement made *de novo!*

J. S. H.

ADVANCE OF ELECTRICAL SCIENCE.

At the recent annual meeting of the Royal Cornwall Polytechnic Society, the first silver medal, value £7, was awarded to Mr. Jonathan N. Hearder, of Plymouth, for a new and extremely powerful modification of the statical induction coil, in which very exalted statical effects were obtained with less than one-third of the quantity of wire usually employed in the machines constructed by M. Ruhmkorff, of Paris. Mr. Hearder first brought out his machine in the early part of the present year, and it was then the most powerful of the kind that had been made; but he has since doubled the power of the machine, although he has at the same time employed one-sixth less of the secondary wire. Mr. Hearder also read a paper detailing some new electrical discoveries which he had made with the instrument, as well as the development of *an entirely new electrical law which he is about shortly to make public.*

GOVERNMENT WORKS AT PORTSMOUTH.

The Government, it is said, have resolved to open a communication between Portsmouth and Langston Harbour, by a canal, 200 feet wide, and 13 feet 9 inches deep. The plans and specifications are said to be ready, the contracts to be shortly taken, and the work commenced. Farther schemes are also said to be under consideration, which, if carried out, will not only render Portsmouth impregnable, but will make it one of the largest Government establishments in the world.—*Builder.*

BLASTING ROCK.

To the Editor of the Mechanics' Magazine.

Sir,—Having recently occasion to undertake the removal of a large mass of hard rock, overlaying a valuable bed of slate, I decided on making the attempt by having fourteen holes of 10 or 12 feet in depth, bored, and each charged with about 20 lbs. of powder. For the purpose of insuring the simultaneous action of all the charges, I prepared a galvanic battery, of ten plates, of 10 inches square, the zinc plates being amalgamated and placed within double copper plates. The main wire, 160 feet in length, was covered with gutta percha, and the branches connected with it were of the same material and similarly covered, and in length about 7 feet each. The end of the wires inserted into the hole were driven through a small plug of wood, which was firmly inserted into one end of a tin cylinder, three-quarters of an inch in diameter, and about 2 inches in length. The extreme ends of both wires being split, a piece of fine steel wire, a quarter of an inch long, was inserted between, and the split hammered close. The tin cartridge had the finest powder put in, and was then carefully corked and varnished over. The tin cartridge thus prepared was placed about the middle of the blasting charge; the hole was then filled with fine sand, excepting a space of 6 inches, which was left between the powder and sand. The battery was charged with water, and 10 per cent. of sulphuric acid. On proceeding to examine the holes after the discharge, I found that the eleven nearest to the battery and the fourteenth, the furthest from it, had exploded simultaneously, but the holes twelve and thirteen had not been ignited. My object in writing now is, to inquire whether any of your correspondents can assign a cause for the failure of the two charges, twelve and thirteen. If your valuable correspondent,

Mr. Roberts, can be found, he will doubtless be able to account for this irregularity. This plan of blasting is one furnished by Mr. Roberts, some years since, to your pages. I imagine that the main wire was too thin, for it is only about one-sixteenth of an inch in diameter. Though the two holes failed, I eventually succeeded in throwing down about thirty thousand tons of rock.

I am, Sir, yours, &c.,

A QUARRYMAN.

INDIA RUBBER (CAOUTCHOUC) AND ITS ADULTERATIONS.

To the Editor of the Mechanics' Magazine.

SIR,—I ought to have remarked in my last paper, that a vast quantity of the railway springs to recipe, given therein, have been supplied to the Austrian, Prussian, and French governments, and approved by the two former. The latter employ very long springs, or cylinders, and subject them to very severe tests, as well as insisting further, upon their being lined with non-elastic lining, which will not, of course, work well with so elastic an article as the one under discussion. This was made worse, by the manufacturer using for this lining a non-elastic canvas at least a hundred per cent. less accommodating than the restrictions imposed. Hence they split under heavy pressure, as your informant judges, more from the total lack of good judgment in the manufacturer, than even the excessive adulterations in the spring, though it is under these trying circumstances that the weakness of the caoutchouc mixed up with these cheap compounds shows itself. The government have since abandoned this lining altogether.

If they are fair goods for usual work, then I trust the information I supply may enable contractors to obtain their wants by competition, furnishing their own form. This will realize a great saving to them; but they must not be induced to accept other goods of greater density under the plea of being better. I may also remark, that the Java gum used in these adulterated articles is ground without undergoing the process of cleansing, but in all articles of light density the cleaning machine frees it from all gritty matter (and costs 6*s.* to 4*s.* per cent.), and it is usually employed in this cleansed state for such, as well as all grey or white goods, of which I shall write you in my next paper. You are probably aware, that Messrs. Mackintosh and Co. claim in their patent for vulcanising all the preparations of sulphur, and without it, so far as I know and believe, no substitute has yet, or is likely to be discovered at a price which can render it commercially available. Indeed I doubt whether any other than sulphurous bodies will vulcanize, or render fit for the use of the engineers the gum called India rubber. Hence the reason why many of the manufacturers are licensed under that firm, and subject to having their goods so stamped. The American inodorous makers attempted to shield themselves (but on legally trying the point) in vain. This screen against Messrs. Mackintosh's patent was called, as a blind, "hypo."* It is prepared in several ways, but is a compound of sulphur and lead, and when perfect, and the lime well washed away, is a very excellent black, costing about 30*s.* per cwt; but its whole efficacy rests with the sulphur, and without it would not vulcanize (though lead works kindly with caoutchouc). This chymical contains about 20 per cent. of sulphur, consequently, five pounds is about equal to 25 ounces of sulphur. This extra cost was readily submitted to, rather than knuckle under to Messrs. Mackintosh's patent. In many cases it was only said to be used, and what really was used, was white lead or lamp black, oxide of zinc, all in connection with sulphur, according as the colour of the goods required rendered necessary. It was pretended also, by these inodorous manufacturers, that white goods, such as the elastic beds advertised as "Improved Hydrostatic Beds," and "Hospital Sheeting," were vulcanized with sulphuret of zinc prepared chemically; when, in fact, it is well known that the cost of the manufacture is quite prohibitory, and is only of value in proportion to its richness in sulphur. What was in reality used, was, and is, the "yellow sulphur," and the "pure precipitate of that article." I mention these things to clear the mystification it may be the interest of manufacturers to keep up, and as I only write from experience, I have reason to believe your readers, who are interested, will better understand the nature and value of unmixed and mixed caoutchouc, after my fund on this question is exhausted; with these remarks I will give the recipe for common black packing at 2*s.* 2*d.* per lb. in quantity, discount as agreed.

* The chemical termed "hypo" is manufactured thus—I merely inclose it as explanatory of that portion of my paper: The sugar of lead is made into a solution with water in a separate vessel. The sulphur and lime are then boiled in water, so as to make a solution of sulphur with the lime. The latter solution (clear) is then poured into the former, which unites with the sulphur, and the precipitate is the "hypo." The hypo is then washed and dried. The lime merely enables the lead to take up the sulphur.

		£	s.	d.
Grind	15 lbs. Java caoutchouc at 7d.	0	8	9
„	15 lbs. Para caoutchouc at 2s.	1	10	0
„	15 lbs. oxide of zinc at 3d:	0	3	9
„	16 lbs. red-lead at 3d. . .	0	4	0
„	10 lbs. China or Cornwall clay	0	0	3
Total	73 lbs. 28 ozs. yellow sulphur . . .	0	0	3
Mill-costs, at 3d. per lb. on 73 lbs.		0	18	3
Costs therefore 10½d. per lb. . .		£3	5	3

The above is 110 or 112 per cent. of adulteration.

I should here remark, there is also a kind of packing in use, which perhaps is practically the best, known as "Rag Packing," made principally from the useless cuttings in the manufacture of India rubber coats, where the gum is run or spread on calico foundations, which is usually the case with the waterproof garments offered for sale at the shops. It is made as follows:

Rag packing, for valves, bearing springs, or in sheets of any thickness, where less elasticity is required, and great pressure.

		£	s.	d.
Grind	35 lbs. useless scraps, say .	0	3	0
„	18 lbs. black-lead, at 2½d.	0	3	4½
„	16 lbs. Java gum, at 7d. .	0	9	4
„	1 lb. yellow sulphur .	0	0	1½
	70 lbs. at 4d. per lb. Mill-costs	£1	3	4
Costs therefore, at 7d. per lb. .		£1	19	2

This is sold at 2s. per lb. in very large quantities, or 1s. 6d. if a shrewd man, net, or small discount for cash.

Our gardens, fire engines, brewers, and pump makers (for suction, &c.,) have found the value of this gum, and the following is the form used with success, and perhaps the adulterations are the best substitutes for pure caoutchouc that the cheap compound market offers.

		£	s.	d.
Grind	20 lbs. Java, at 7d. . . .	0	11	8
„	10 lbs. Para, at 2s. . . .	1	0	0
„	14 lbs. white-lead, at 3d. }	0	7	0
„	14 lbs. red-lead, at 3d. }			
„	1½ lb. yellow sulphur . .	0	0	3
Total	59 lbs., at 3d. per lb. Mill-costs	0	14	9
Consequently costs, at 10½d. per lb.		£2	13	8

This is spread upon flax cloth (Messrs. Richards and Co., Bread-street, are manufacturers,) *which weighs 10, 16,* and 32 ozs. to the square yard, and is about the same cost as the compound, so that the weight is the truest criterion of cost, and is so calculated by the manufacturer.

The eminent house of Warner and Sons use it as suction pipe for their pumps of three-ply stoutness, and it is made of two-ply medium flax, and one ply of the stoutest flax outside, or *vice versâ.* I have no doubt by using one ply only of the stout flax, wired with strong galvanized iron wire, they would make it less costly, and infinitely more enduring. This medium flax cloth hose, should uniformly be bought, and is often used, yet charged for as extra stout. The same compound is used, spread upon the like flax cloth, to make bands for machinery, &c., instead of leather, and is stated on the manufacturer's list, "warranted not to stretch, or require taking up," &c. I have only to add, this is all a delusion; it will not supersede leather bands, having, so far as my experience teaches, entirely failed in all these respects; and, as a band for machinery is totally useless, and dear at a gift. Excepting garments, every other description of black goods are made from such forms as I have figured, with very little variation according to the requirements of the engineer, and which needs very little judgment or experience to meet. To those who cling to these heavy goods, the formulas I have rendered will enable them to have supplies at a fair competing charge according to quality, and it is their own fault entirely if they persist in purchasing 100 per cent. of cheap powder at the same charge as for "pure caoutchouc" of a third their density. In my next paper I shall treat of the brown, grey, and white goods, if you will permit space in your independent Journal, and point out the nature of that surface bloom seen thereon, and their better value, with any other remarks, &c., (the knowledge experience has taught) which may appear useful to the engineer or general dealer in India rubber articles, and render this apparently occult manufacture less opaque and secret.

I am, Sir, yours, &c.,

W. H. HERBERT.

Mitcham Common, Sept. 8, 1856.

INVALID WHEEL CHAIRS.

To the Editor of the Mechanics' Magazine.

SIR,—I fear that your afflicted correspondent "*Presbyter Claudicans*" (page 303 of this day's number) is in search of that which has been a desideratum from the days of Tubal Cain to the present, and will remain so to the end of time; that is—a mode of "*increasing power!*" I cannot therefore attempt to assist him in that

search, but will point out for his benefit, what is possible under the circumstances to which he refers, leaving him to avail himself of so much as may be useful in the information offered.

Manumotive invalid chairs are, for the most part, moved about by concentric hand-wheels a little smaller than the travelling wheels to which they are attached; but when the infirmities of the invalid render this mode of propulsion too laborious, the concentric hand-wheel is exchanged for a crown-wheel, driven by a pinion on a vertical rod, on the top of which is placed a cranked handle within convenient reach of the operator.

By this means, locomotion is effected with a very small amount of exertion, but at a correspondingly slow rate of progression, in exact proportion to the relative dimensions of the wheel and pinion; which may be such that a tenth, or even a twentieth of the power required to be applied to the rim of the hand-wheel may now suffice; but the movements of the chair will, of course, be ten or twenty times slower.

The most convenient and easily adjustable plan of propulsion that occurs to me is the employment of two corresponding conical pulleys (say of three grooves each, 6 ins., 12 ins., and 18 ins. in diameter) worked by an endless band. The lower pulley is to be attached to the travelling wheel; the upper one to the chair frame, in an inverted position, that is, the smallest groove of the one opposite to the largest groove of the other. Motion may be given to the upper pulley by a hand wheel, or by a cranked handle adjustable as to leverage, by sliding through the axle of the pulley. When the endless band is in the middle grooves, which will be of equal diameter, a certain amount of power will produce a given rate of motion; but if the band be shifted to the smallest upper, and largest lower pulley, the power required to be exerted, and consequently speed obtained, will be diminished one third. On the other hand, if the band be made to encircle the largest upper, and smaller lower pulley, an opposite result will obtain; three times as much power will now be required to propel the chair, but it will travel three times faster than before.

In this, as in every other possible mechanical arrangement, whatever is *gained* in power is *lost* in time, or *vice versâ*; and this must be the result, whichever modification of the two mechanical powers—the lever, or the inclined plane—we press into the service.

The advantages of the arrangement I have suggested are, in my opinion, the ready adjustment of speed and power to the peculiar requirements of the occupant of the chair, and the great superiority of the band motion over wheel work for such a purpose.

I am, Sir, yours, &c.,

Wm. Baddeley.

13, Angell-terrace, Islington,
Sept. 27th, 1856.

THE MOON'S MOTION.

To the Editor of the Mechanics' Magazine.

Sir,—The very dubious terms in which a letter, signed "S. A. Good, Pembroke-dock," which appears in this day's number of the *Mechanics' Magazine*, is conceived, induces me to trouble you with a very few words on this much vexed question. I fear that Messrs. Symons, Hopkins, and Co., may consider the facts stated by Mr. Good to make for their side of the question, even if the writer himself did not bring them forward with that *animus*.

The facts themselves, as stated by Mr. Good, are true enough, and are a natural consequence of the rotation of the earth, and of the rotation of the hands of the clocks, which must, of course, be combined in order to obtain the rotation of the hands round some axis which does not partake of the earth's motion, as the earth's axis. While, therefore, *relatively* to the earth itself, the hands on both the faces of the clock perform the same number of revolutions; yet, as in the case of the northern face, this motion is in the *same direction* as that of the earth round its axis, and in that of the southern face, in the opposite direction, the number of revolutions of the hands of the northern face *round the earth's axis* will be *one less*, and of those of the southern face *one more* than their common relative number of revolutions on the dial-plate in twenty-four hours, during which the clock itself has made a complete revolution round the earth's axis. There is nothing extraordinary in this; nor is there anything in this fact in the least reflecting on the merit of the principle on which Professor Airey, Dr. Lardner, and others, ascribe rotation on its axis to the moon.

I could mention many other "curious facts" of the same kind, arising from similar causes. For instance, it is a "curious fact" that if a person make a complete circuit of the globe, travelling from west to east, he will gain a day, while travelling in the opposite direction he will lose a day in his reckoning, and that too, however long or short a period of time he may spend in making the circuit! It is "a curious fact" that, a vessel at sea, steaming at the rate of ten knots an hour, while the tide is running two knots, will make good twelve knots or eight only, with regard to the land, according as she is going with or against the tide.

It is a "curious fact," that a man walking at the rate of four miles an hour on a raft, which is floating down a stream at two knots, will go at the rate of six miles an hour in the same direction as the raft, or at the rate of two miles in the *opposite* direction, relatively to a point on the bank of the stream, according as he is walking in one direction or the other.

These facts are no less extraordinary than those which Mr. Good produces. Does not common sense teach us that, if there be three bodies A, B, and C, and B has a certain motion relative to C, while A has another motion relative to B, the relative motion of A to C must be compounded of that which it has to B, and of that which B has to C?

If only the innovators were to master this fact, we should hear no more of the moon's non-rotation. By-the-bye, it seems never to have struck these gentlemen that, in accordance with their theory, the earth's rotation about her axis is miscalculated, and that in the course of a year she makes 364 instead of 365 revolutions!

I am, Sir, yours, &c.,

A Looker On.

London, Sept. 20th, 1856.

To the Editor of the Mechanics' Magazine.

Sir,—Your correspondent, Mr. Good, of Pembroke Dock, comes forward in your last Number to augment the surprise which the letters of those inexcusable gentlemen, Mr. Jelinger Symons and Mr. Evan Hopkins, must have excited in your readers. If all clock-towers happened to be built perpendicular to the axis of the earth there would be some truth in the fact adduced by that gentleman. The same thing might be said if all "public clocks" were situated at the equator, which is not, I believe, the case. But that there is anything "curious" in the fact to persons acquainted with dynamical laws I cannot believe.

With tyros Mr. Good's suggestion will have, I should think, great weight, but with dynamicians none. I remember the time when I might have read Mr. Good's little letter, and, combining the motion of the hands which the clock-work produces with that acquired from the earth's rotation, have puzzled out his meaning, and pronounced him correct, and thought him clever. But I was a very little chap then, and my knowledge of "absolute" and "relative" motion was exceedingly, and I hope excusably, small. Mr. Good ought not, however, to have found anything "curious" or unfamiliar in the fact mentioned. For, if I have not fallen into a mistaken identification, Mr. Good is the gentleman who wrote recently on the "Decimal Question," and is the master of a Government School. (If so, I sincerely trust that Mr. Jelinger Symons is his inspector). He therefore must be supposed to have a tolerable knowledge of those sciences which, when properly understood, save a man from countenancing many follies which fascinate the ignorant.

If the moon itself had but the smallest interest in this precious controversy, I should be better able to account for much that has recently been written.

I am, Sir, yours, &c.,

A Patient Reader.

Sept. 22nd, 1856.

PHOTOGRAPHY (HELIOGRAPHY) AN ENGLISH INVENTION.

To the Editor of the Mechanics' Magazine.

Sir,—When broaching the above subject in your columns, I little thought that the name of M. Niepce was one by no means forgotten and exploded. I have just received from Paris a work of which the following is the title:—"Traité Pratique sur la Gravure Heliographique, par M. Niepce de St. Victor, Membre de la Legion d'Honneur. Paris: Masson. 8vo. 1856," with a beautiful heliographic engraving.

From the preface of M. Niepce de St. Victor, I perceive that he is the nephew of M. Niepce, the inventor of Photography; and I also see that the first experiments were made so far back as 1813, the time to which Mr. Francis Bauer, F.R.S., probably alluded in his communications to me. There is not a word said about the affair and correspondence with the Royal Society of London, as M. Niepce, the uncle, probably considered this as a contemptible act of *red-tapeism*, of which he never made any mention. Your late exposure of the *Cort* intrigue, by which a whole family has been hurt and impoverished—the family of a most worthy and useful inventor—has brought forth the *names* of the parties who performed this act of public spoliation. It is desirable also that the names of the *F.F. R.R. S.S.*, who put the inventor of Heliography out of doors, should become known. It would go *some* way towards checking that *heroism* of persons in power to *dare* anything, however wrong, inhuman, or wicked. Still, history is a severe avenger.

Die Weltgeschichte ist das Weltgericht!

J. Lotsky.

15, Gower-street.

MR. BESSEMER'S INVENTION.

To the Editor of the Mechanics' Magazine.

Sir,—Noticing your account last week of M. Avril's patent, I think it may perhaps interest your readers to see the relation in last Saturday's *Mining Journal* of the results of his process, as carried out on the large

scale by my late father, nearly forty years since, under a patent long expired. The only part, therefore, of this inventor's process which will entitle him to rank as *Avril premier* is the use of pure oxygen gas. I would suggest that a patent for economically obtaining sufficient pure oxygen for an iron-smelting furnace, is likely to be the most valuable. Until this is done, his process will be very apt to remain in abeyance, like the gas-fuel patent, which we are told is waiting for a cheap supply of gas. As to the other matter, on which I perceive you think I have reached a judgment prematurely, we shall see about that by-and-bye. Solicitors, of course, will think any opinion premature which relieves an important case from the progression of their tedious impudence; but the interest of patent agents is directly the reverse; the safer they can make a specification, so as to give the attorneys no chance, the greater will be their reputation and practice with genuine inventors. But I cannot see how it is possible that the lawyers can reap any benefit between Messrs. Martien and Bessemer. The question of priority is clear, and so is all the other evidence. I can form no idea what Mr. Bessemer can rely on for a claim, except his axes, &c., &c., &c.; those, of course, are his own. I should be pleased to hear, after all the trouble and expense he has taken, some valid reason advanced to show he is not quite shut out from the main point. I am, Sir, yours, &c.,

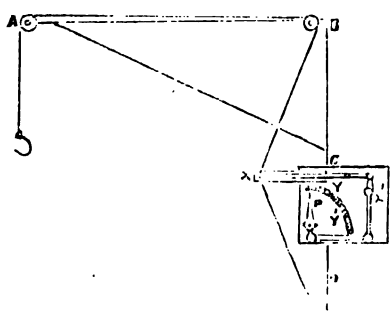
DAVID MUSHET.

Sept. 30th, 1856.

WEIGHING-CRANES.

To the Editor of the Mechanics' Magazine.

SIR,—I read with interest this week a description of Messrs. Fletcher's mode of combining a weighing-apparatus with an ordinary crane; but I think that I can show a more efficacious mode of doing the same



thing, which, with your permission, I will explain.

Let A, B, C, D be the skeleton of a common crane; *x*, a cylinder having a piston, *y*, fitting into it, which has two joints, as shown; *x'* and *y'* two more levers, the latter connected with a pointer, P, which must be supposed to have a strong spring behind it, in an opposite direction to that in which the force comes; this pointer is to move along an arc graduated for the purpose, and the whole is to be fixed on a board, including the cylinder, *x*.

The rope must then be made to come in contact with the piston, *y*, by means of grooves cut in the cylinder, *x*, on either side of it; and when the weight is suspended, the pressure of the rope against the piston will work the whole leverage, and the weight may be read off the prepared arc.

This method in no way impairs the strength of the crane, and I think is more simple than Mr. Fletcher's.

I am, Sir, yours, &c.,

J. A. D.

Reading, Sept. 22nd, 1856.

CONSTRUCTION OF ARCHES.

To the Editor of the Mechanics' Magazine.

SIR,—The contradiction and denial of "J. A. D.," in reference to my remarks on his proposition, do not, in my opinion, nor in the opinion of others who are practically acquainted with the subject, substantiate in any way his asserted proof of the superiority of the proposed joints over the present system of radiating joints of arch stones. The statement of "J. A. D.," that "*the stones remain in equilibrium being the most advantageous position they can be placed in*," is extremely simple, because there is no other position but equilibrio for any arch, and it is only when it is thrown out of shape, by settlement or thrust, that the equilibrium is destroyed; hence the question for our consideration is, whether the equilibrium is better preserved by joints not in the line of radius, to say nothing of the mortar; and until a more substantial proof be given by "J. A. D.," it would only lead to vexatious and dangerous results to build an arch according to the proposed lines and novel system of centreing. I am, Sir, yours, &c.,

F. P.

CALICO PRINTING.

To the Editor of the Mechanics' Magazine.

SIR,—Can any of your numerous readers inform me if any means have ever been proposed and adopted in calico printing, to prevent "doctor" streaks, slips, or any other imperfections, caused by the "doctor" at present in use?

If any, of what nature are they?

I am, Sir, yours, &c.,

W. T. W.

Glasgow, Sept. 24th, 1856.

HOUSE DEFENCE BY FRICTIONAL GRENADES.

To the Editor of the Mechanics' Magazine.

SIR,—Having read lately, in the *Times*, three letters signed respectively "Revolver," "Pistol," and "Man-trap," stating that attempts had been made by robbers to enter houses in the vicinity of Notting-hill, I beg to submit for consideration a reference to my frictional grenade, as exhibited at the Crystal Palace and the Royal Polytechnic Institution, which can be effectually used without exposure of the person. I have already (without *beseeching* any "Circumlocution Office") explained the nature and manner of preparing this very simple and efficient grenade to the sergeant of police at the Notting-hill Police-station. The *Times* of yesterday gives a startling account of the insecure condition of that vicinity.

I am, Sir, yours, &c.,

J. NORTON.

Rosherville, Sept. 30th.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

ANDERSON, J. B. *Improvements in the manufacture of soap, parts of which improvements are applicable to preparing materials for the purposes of illumination, and also for the purposes of lubrication.* Dated Jan. 31, 1856. (No. 268.)

This invention comprises several methods of treating the niger produced in treating fatty matters, &c., so as to form the above materials.

HURST, T. *Improvements in the connecting of the rails or metals generally used on railways.* Dated Jan. 31, 1856. (No. 269.)

This invention consists in connecting the lengths of rails by a peculiar mode of "scarfing" or scarf-jointing, and so that the rails shall have bearings against each other, and against the flanges thereof.

JOHNSON, J. H. *Improvements in gas-burners, and in regulating the combustion of gas.* (A communication.) Dated Jan. 31, 1856. (No. 270.)

According to this invention, which is an improvement upon a patent dated 3rd Feb., 1853, in place of boring out two converging chambers in a metal cup to form the two burners, it is proposed simply to insert two of the ordinary Manchester burners, with their upper ends slightly converging in a metal cap, which forms the main or double burner.

KER, M. *A machine for sweeping carpeted and other floors.* Dated Feb. 1, 1856. (No. 272.)

The patentee fixes in a case a cylindrical brush, which has a pulley on the middle of it. To the case is attached a long handle, near the end of which a winch handle is fixed; a cord is passed over the pulley on the brush, so that the operator can take hold of the handle by one hand and turn the winch with the other, and so cause the brush to revolve.

SCHISCHKAR, E. *Improvements in dyeing and colouring wools, hairs, silks, yarns, and textile fabrics made of the same materials either wholly or partially.* Dated Feb. 1, 1856. (No. 273.)

The patentee has discovered that wools, hairs, &c., when impregnated with the salts or oxides of copper, or the salts or oxides of lead, can be acted on by reducing or deoxydising agents, such as the proto-salts and oxides of tin and iron, arsenious acid, arsenites, sugars, &c., so as to impart to them a bright lustrous appearance. The reducing or deoxydising agent which he prefers is sugar.

PRESTON, F. *Improvements in machinery for shaping and rolling metal.* Dated Feb. 1, 1856. (No. 274.)

This invention was described and illustrated at page 241 of our Number for September 13, (No. 1727.)

HOLCROFT, G., J. SMITH, and T. HOLCROFT. *Improvements in machinery for preparing, spinning, and doubling cotton and other fibrous materials.* Dated Feb. 1, 1856. (No. 275.)

This invention consists in a combination of machinery whereby rovings may be wound on parallel bobbins, or yarn may be wound in the form of a cop, as in the machines for spinning and doubling called mules.

MOATE, C. R. *An improvement in securing and sustaining the rails of railways.* Dated Feb. 1, 1856. (No. 276.)

This invention consists in holding the rail in a chair rolled in two pieces, of such a form as that each half may support upon a solid bearing the bottom of the rail, and clip the same on either side, the jaws of the two portions being firmly bolted through the middle of the rail.

FONTAINEMOREAU, P. A. L. DE. *Certain improvements in the saponification of fatty matters.* (A communication.) Dated Feb. 1, 1856. (No. 277.)

These improvements consist—1. In submitting, in the process of saponification, the fatty bodies placed in a suitable vessel to a temperature not exceeding 190° Fahr. 2. In the employment of an improved agitating or beating machine, in combination with the heating process.

LAMB, A., and J. RONALDS. *An improvement in the construction of iron ships, boats, and other similar structures.* Dated Feb. 1. 1856. (No. 279.)

This invention consists in uniting the plates which form the skin of the ship by strips, similar to butt strips, placed outside of the skin, whereby the liners or filling pieces ordinarily used for filling up the spaces between the frames and the skin of the vessel are dispensed with, and the whole of skin or plating is brought in contact with the frames.

FAWCETT, F. B. *Improvements in the manufacture of carpets.* Dated Feb. 1, 1856. (No. 280.)

This invention, which has reference to the manufacture of carpets by power looms, consists in improving the design and surface of the carpets by forming the loops or piles with single threads and longitudinal wires, in place of double threads and longitudinal wires, as in Mr. W. Mowbray's patent, dated 21st May, 1855.

BESTWICK, H., and J. BURY. *Certain improvements in cocks, taps, or valves.* Dated Feb. 1, 1856. (No. 281.)

This invention consists in constructing a self-closing tap, by placing a spring in the cap or top of the cock, tap, or valve, so that it shall press against the spindle to which the valve is secured so as to keep the valve always closed, and also against the stud or button which receives pressure from without when the valve is to be opened. Should the tap get out of order, the spring and other parts may be at once detached, and repairs performed.

HOOPER, G. N., and W. *Improvements in springs for carriages, and for the cushions of carriages, chairs, mattresses, beds, and other similar articles.* Dated Feb. 1, 1856. (No. 282.)

The improvements consist in applying india-rubber springs in the form of endless bands or rings, or in straight lengths, in combination with the steel springs for carriages, and in using them in such manner that the springs shall be brought successively into action according to the weight of the load which is placed upon them.

CHANCE, J. T. *Improvements in furnaces used for flattening glass.* Dated Feb. 1, 1856. (No. 283.)

In this invention the beds on which the glass is flattened and cooled are placed each on a frame consisting of two parallel bars or rails connected together. These bars or rails rest on and are carried by the upper surfaces of rollers, which move on two parallel fixed rails. The rollers for each bed are kept correctly in position in respect to each other by a frame and axles, and they are kept correctly on the fixed rails on which they move by flanches or grooves to the peripheries of the rollers, or to the rails on which they move.

JOUBERT, C. C., and L. A. BORDIER. *Improvements in motive-power engines.* Dated Feb. 1, 1856. (No. 286.)

This invention consists of a multiplex thread-screw forming the extension of a shaft upon which a piston-paddle is keyed; this is intended to work into a cylinder having two openings for admitting and one for emitting steam, and which is also provided with a fixed inside partition. When steam is let through such an apparatus it presses against the fixed partition, acting at the same time upon the piston-paddle connected with the shaft, which is thus carried into a circular motion.

MILLER, B. F. *Improvements in ventilators for chimneys and other purposes.* Dated Feb. 1, 1856. (No. 287.)

This invention cannot well be described without illustrations.

BEAMISH, J. O'M. *An improvement in the manufacture of morocco leather.* Dated Feb. 1, 1856. (No. 288.)

Claim.—The application, to the manufacture of morocco leather, of the skins or hides of oxen, horses, cows, calves, and other large animals, from which skins or hides the inner and fleshy part has been removed by cutting, paring, or shaving away the same, so as to reduce them to the required thickness.

WARD, J. T. *A new or improved omnibus.* Dated Feb. 2, 1856. (No. 289.)

This invention consists—1. In making the fore part of an omnibus of greater diameter than the hind part. 2. In arranging the seats in the interior of the omnibus in a certain manner which cannot well be explained without illustrations.

DAY, J. R. *A new or improved door-lock and latch.* Dated Feb. 1, 1856. (No. 290.)

The patentee describes a door-lock and latch, the mechanism of which is principally contained in the hollow sides of a case which passes round the door, and requires but a small portion of the door to be cut away for its reception.

BURLEIGH, B. *Improvements in certain parts of the permanent way of railways.* Dated Feb. 2, 1856. (No. 292.)

1. The patentee constructs a key of wrought iron, either as an entire tube, or with a slit in the direction of its length, so as to be slightly compressible when driven in between the rail and the chair. He also constructs a solid key, the same being made slightly larger than the interior of the key already described, and he uses them together, by driving the solid key into a hollow key to make it fit more tightly. 2. He constructs a key or wedge to be inserted between the rail and the chair, and so fitting between certain parts of the rail and the jaw of the chair as to form, in conjunction with the chair, an improved rail holder in two parts, without the aid of elastic pack-

ings, and without the addition of other wedges, or keys, or bolts and nuts. 3. He constructs a pair of wedges to be used with a chair of improved form, and when inserted between the rail and the chair, the wedges are made to move from each other in opposite directions, either by a right and left-hand screw, or a vertical wedge for forcing them apart and fixing the rail. He constructs a chair of iron, having a groove or space in that part below the under side of the rail for preventing the indentation or notching of the centre portion of the lower table of the rail. 5. The invention consists of certain modifications of a former patent for crossings and switches, dated Jan. 9th, 1854.

GOODMAN, W. *Improvements in machinery for producing knit or looped fabrics.* Dated Feb. 2, 1856. (No. 294.)

The needles are made suitable for producing work at each of their ends, and the form of needle preferred is that which at one end has an ordinary beard, and at the other end a hook and tongue. These needles are placed in a suitable needle bar so that they may be moved from and to the back of the knitting-frame and be held correctly by bars moving on axes, such bars on one side being of a greater radius than in other directions. The thread carrier is arranged capable of laying the thread for any number of frame courses, or of turned or machine courses, and the needles are worked accordingly; and there is a top machine combined with the other mechanism, so that the work may be shifted by points off and on the frame or beard ends of the needles to produce fancy work. By these means any number of plain or fancy courses may be produced on the frame or beard ends of the needles, and then one or more of the turned or machine courses.

TOLHAUSEN, A. *Certain improvements in machinery for picking, carding, and combing fibrous substances.* (A communication.) Dated Feb. 4, 1856. (No. 295.)

This invention consists of a method of attaching and securing the teeth employed for picking, carding, &c., to the cylinder by which they are carried. It also consists in a mode of constructing the surface of the cylinder, whereby, in its revolution, it is made to serve the purpose of a fan or blower to blow the fibres from its own teeth after the operation.

BODMER, R. *An improved lubricating oil.* (A communication.) Dated Feb. 4, 1856. (No. 297.)

The inventor describes a number of processes for operating upon coal tar to produce a lubricating oil.

WALLER, R. *Improvements in preparing cotton and other fibrous materials.* Dated *Feb. 4, 1856.* (No. 298.)

This invention consists in applying to carding engines certain machinery whereby the fleece of cotton from the main cylinder is separated into several parts, each of which is formed into a roving, and deposited into a can by means of, or without the aid of, a coiler.

ROBINSON, E. S. *Improvements in machinery for lithographic and zincographic printing.* Dated Feb. 4, 1856. (No. 299.)

This invention consists in the employment of rollers and other machinery for damping the stone or zinc whilst in motion; the employment of springs upon a cylinder for taking paper, silk, or other fabric, and passing it between a cylinder and the stone or zinc; also, the employment of a cylinder for pressing the fabric upon the stone or zinc, and the application of a forward and backward motion for moving the stone or zinc.

CLARK, E. *An improvement in the apparatus for suspending insulated electric telegraph wires.* Dated Feb. 4, 1856. (No. 301.)

This invention is described and illustrated at page 177 of our Number for Sept. 20, (No. 1728.)

AGER, N. *Improvements in connecting spindles of locks and latches with their knobs and handles.* Dated Feb. 4, 1856. (No. 304.)

This invention cannot well be described without illustration.

THOMAS, G. C. *An improved method of hardening and tempering steel.* (A communication.) Dated Feb. 5, 1856. (No. 307.)

This invention consists in hardening, tempering, and restoring steel, by applying to it, when heated, a finely pulverised compound of chloride of sodium, bichromate of potash, and prussiate of potash. For ordinary purposes the proportions should be 21 parts of the chloride of sodium, 8 of bichromate of potash, and 8 of prussiate of potash.

HINCHLIFFE, T. *Certain improvements in machinery or apparatus for drawing and spinning wool or other fibrous substances, or wool mixed with other fibrous substances.* Dated Feb. 5, 1856. (No. 309.)

The fibrous substance to be drawn or spun is passed between rollers, as in mules, &c., these rollers resting on a moveable frame, after which it is received by and passed between a pair of drawing rollers, and through the axle of a pulley containing the same to a "flyer," and on to the bobbin or spindle, such drawing rollers having a pinion to receive motion, and revolving in steps fixed to a pulley; the sides of contact of the drawing rollers are transverse to or across, and at or near the centre of the axle of the pulley. Also, revolving loose in the axle of the pulley containing the drawing

rollers, is a pulley with toothed gear applied to the pinion to give motion to the drawing rollers.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

WILKINSON, T. F. *Improvements in reaping or mowing-machines.* Dated Jan. 30, 1856. (No. 253.)

This invention consists in an apparatus for removing the grain from the platform of such machines, and depositing it on the ground at the sides in heaps suitable for binding. Underneath the platform are two rakes, rigidly attached, which move transversely to the course of the machine. These rakes are provided with teeth rigidly attached to a shaft working in bearings fixed to the rake, and which teeth project up perpendicularly through slots in the platform. One of these rakes by suitable mechanism moves the corn to the centre of the platform, and the other rake moves it to the ground at the side of the machine, and as soon as such motion is completed the projections on the shafts of the rakes come in contact with a projecting pin, which cause the teeth to assume a horizontal position to allow the rake to move to the other side of the platform to again remove the corn, and when the rakes have completed such motion, the projections strike against other pins, causing them to again assume the perpendicular position.

STOKES, J. *An improvement or improvements in fog-signals.* Dated Jan. 31, 1856. (No. 256.)

This invention consists in casting the body and arms of the signal in one piece.

DESCOS, A. E. C. *Improvements in consuming smoke.* Dated Jan. 31, 1856. (No. 258.)

The inventor employs a chamber containing two sets of fire-bars, one set horizontal and one inclined, and a tuyere arranged in such manner that the smoke is carried away by the current of air from the tuyere, mixes with the same current, and passes under the grate, in contact with the distilled fuel.

NAPIER, G. *Improvements in apparatus for raising, lowering, and suspending boats from ships.* Dated Jan. 31, 1856. (No. 260.)

This invention consists in supporting boats' davits by two vertical screws, sustained at the upper part by an arm or standard raised from the gunwale, and in which the screws are free to rotate. The screws are stepped into two bearings fixed in the side of the ship. The davits have each a long boss with a female screw, fitting the vertical screws, by turning which screws, and at the same time preventing the davits moving round with them, the davits will be carried up or down on the screws. The boat is slung by claws or hooks, which open like smith's tongs, the long ends of which clasp the gunwale, the whole being hung from the short ends by a short chain or rope, the tension of which keeps the long arms together, so that on the boats alighting on the water they release their hold.

KINNIBURGH, J. *Improvements in moulding or shaping metals.* Dated Jan. 31, 1856. (No. 262.)

In moulding and casting pipes, &c., core bars capable of expanding and collapsing are used. These bars are each composed of longitudinal pieces of curved metal or segmental metal plates, combined so as to be capable of forming core bars of various diameters, by being disposed annularly with their longitudinal junction edges in contact.

HARRISON, J., and J. ODDIE. *Improvements in machines for winding yarn or thread on to spools or bobbins.* Dated Jan. 31, 1856. (No. 263.)

The inventors describe an arrangement of conical cups and warfs placed on suitable rails in a frame, revolving motion being imparted to them by bands from a drum, from which, by a suitable gear, a heart-wheel or cam is worked to produce the motion for traversing the yarn or thread to lay it evenly on the spools or bobbins.

RENDER, H. *A new or improved lubricating material.* Dated Jan. 31, 1856. (No. 265.)

This material, which is denominated "palmatine," is the harder or more consistent part of palm oil, left as a residuum in preparing the oil for other purposes.

KERSEY, F. *An improvement in the manufacture of drain-pipes.* Dated Jan. 31, 1856. (No. 266.)

Each length of drain pipe is formed with two half sockets, one at each end, and on the same side of the pipe, by which, when laying down a drain, the alternate pipes will have their half sockets downwards, and the other alternate pipes will have theirs upwards, so that the pipes may be taken up without breakage, and each will have a uniform bearing at its two ends.

MACPHERSON, A. *Improvements in obtaining and applying motive power.* (A communication.) Dated Feb. 1, 1856. (No. 271.)

The inventor proposes to form a reservoir for compressed air near and below the furnace, and under the usual cylinder and pipes to pass the air through the furnace, whence it will proceed through conduits and form a junction with the steam, and will, thus combined, be used as a motor.

DRAY, W. *An improved cartridge-box and pouch.* Dated Feb. 1, 1856. (No. 278.)

The sides, back, and bottom of the box are formed of, or covered with leather. In the upper part is fixed a tray with divisions, each of which is intended to contain a cartridge, and over this case is a lid hinged to the back. Between the bottom of the cartridge case and that of the box there is a space for stowing small articles, and at the front of this space is fitted a flap, and at the front of this flap a pocket for caps. The flap is kept closed by a turnscrew. The handle of the turnscrew is formed into a nipple-wrench, and carries also a pin or pricker. A leather flap folds from the back over the top, and encloses the front of the box.

DUCKETT, G. *Improvements in carts and vans.* Dated Feb. 1, 1856. (No. 284.)

A cart or van is made with a moveable cover at the upper part, which cover descends to the foot-board. On the upper and at the front part of the cover is fixed a driving seat, so that when the cover is placed on, the cart or van will be closely covered at the top and in the front, and be closed in, as usual, by the flap at the back. When the cover is off it will be an ordinary open cart or van.

DANNEQUIN, A. E. *Certain improvements in caoutchouc or any other waterproof garments.* Dated Feb. 1, 1856. (No. 285.)

The inventor makes a series of holes in the fabric to allow of the free passage of the heated air or perspiration from the under garment. These rows of air holes may be covered by flaps of the waterproof material, or concealed by rows of buttons or other similar means, without impeding the ventilation.

NAPIER, G. *Improvements in breaks for railway and other carriages.* Dated Feb. 2, 1856. (No. 291.)

These improvements in breaks relate—1. To a self-acting railway break which comes into action when any compression of the buffers takes place. The breaks consist of segments of suitable material, suspended from joints from the framing, and opposed to the tyres of the several wheels. A link connects the lower end of the segment to the buffer head. 2. To breaks for vehicles for common roads.

CURTIS, W. J. *Improvements in machinery for excavating land for the construction of tunnels.* Dated Feb. 2, 1856. (No. 293.)

In carrying out this invention a frame is constructed, and is arranged, when placed in an upright position, to be moved forward by hydraulic pumps or mechanical means, pressing against the work which has been completed. There are three uprights; the two outer ones have reversed screw-threads formed thereon, in such manner that a screw-nut on each of them, when caused to rotate, shall ascend its upright, and when it arrives at the end again descend. These nuts turn between two plates, which carry an endless chain, and wheels by which the chain is carried. The central upright is a shaft which gives motion to the chain wheels and chain. In order to cut the land in front, the chain carries ploughs or cutters which act as the chain is caused to move. The central upright or shaft is put in motion by a steam engine which moves on suitable rails up to the work. Rails are also laid as the work progresses, so that trucks may bring up bricks and materials to build up and form the tunnel, and the earth is raised into the empty trucks by buckets or lifters put into motion by the steam engine.

PAULING, R. C. *Expelling water from vessels and keeping them from sinking, raising sunken vessels, keeping water out of coffer-dams, caissons, foundations, or vessels, or works that are below water, and propelling vessels on and through water.* Dated Feb. 4, 1856. (No. 296.)

The inventor proposes to effect all the above-named objects (except the last), by forcing compressed air into the various vessels under considerable pressure, and to propel floating vessels by discharging compressed air therefrom under the surface and against the water, by means of blast fans, air pumps, and pipes.

HUDSON, C. H. *A retiring door or lid for boxes, cabinets, closets, rooms, carriages, and for all places or receptacles where or in which doors or lids are at present in use or may be used.* Dated Feb. 4, 1856. (No. 300.)

This invention consists in providing the room, box, or other receptacle, with grooves corresponding with each side of the door or lid thereof; a guide-piece sliding in such grooves carries the door or lid, and by means of hinges, and by guiding the same in the said grooves (aided in some positions by runners), the door or lid is opened, causing the front of the receptacle when open to present a perfectly flush appearance.

WHITING, M., jun. *Improvements in preparing for and in tanning hides and skins.* Dated Feb. 4, 1856. (No. 302.)

In carrying out this invention the hides or skins are suspended from the sides of a pit, so that the upper ends are below the liquor therein, and their lower ends are kept just above the bottom of the pit. Above the pit is suspended a frame which descends into it, and its lower end divides the pit transversely into two compartments, and it is free to be moved slowly to and fro. The hides or skins hang nearly or quite touching each other, and the frame presses those on each side alternately.

THOMSON, J. *Improvements in centrifugal apparatus to be used in the separation of liquids from granular and crystalline matters.* Dated Feb. 4, 1856. (No. 303.)

This centrifugal apparatus is constructed with chambers contained between an outer and inner surface of reticulated or perforated metal or straining material, such surfaces being so arranged that the liquid matter shall pass through the straining surface, whilst the more solid portions are thrown into a separate part of the apparatus.

TURNER, W. A. *An improved preparation or mixture to be used in the manufacture of compounds of India-rubber or caoutchouc.* Dated Feb. 4, 1856. (No. 305.)

This preparation is composed of genuine bismuth, ordinary lead, virgin tin, and sulphur, in about the following proportions; namely, of genuine bismuth, 5 parts; ordinary lead, 3 parts. These are melted separately, and mixed together with half their weight of sulphur. In using the above mixture, the inventor mixes 10 lbs. of it with 30 lbs. of India-rubber or caoutchouc.

MILLS, T. *Improvements in machinery for the manufacture of looped fabrics.* Dated Feb. 4, 1856. (No. 306.)

This invention consists in the employment in stocking frames of one set of needles or hooks, having a beard at one end and hooked at the other, to produce fabrics with both sides alike, or with a face on one side only. Instead of a needle bar, a slee or comb bar is used as a receiving bar, and a lever bar acted upon by elastic springs, is employed to hold the hooked ends of the needles, whilst one part of the course is being performed. A comb or slee bar is applied on the front of the frame, as a receiving or depositing bar, and a lever is used to fasten the beard ends of the needles during the requisite time. The invention also comprises machinery for producing patterns upon looped fabrics, consisting of a "top machine" worked with points or guides, acted upon by a revolving cylinder, upon which the required pattern is cut.

HYCKERT, F. V. O. *Improvements in heating.* Dated Feb. 5, 1856. (No. 308.)

This invention consists in placing in a common fire-grate a curved tube. The air enters the tube at the lower extremity (which may be concealed by the foot of the apparatus) and passes out at the other, having been heated by going through the tube in the fire-grate. Another vertical tube attached to the former, conveys the hot air to any part of the apartment required to be warmed.

PROVISIONAL PROTECTIONS.

Dated August 27, 1856.

1995. Joseph Manuel Giresse, of St. Macaire, French Empire. A new machine to mince tallow and meat.

Dated August 30, 1856.

2017. Armand Louis André Herbelot, mechanician, of Paris, French Empire. Improvements in obtaining motive power by gases or fluids.

2019. John Pope, of Canterbury, Kent. Improvements in the mode of cultivating and treating the hop plant.

Dated September 9, 1856.

2097. John Watson, of Tureen-street, Glasgow, Lanark, N.B., manufacturer, and Charles Frederic Halle, of Manchester, Lancaster. Improvements in spinning or twisting fibrous materials.

2099. Hannay Cunningham, of Pitarthie, Fife, Scotland, gentleman. The production of blanks for bank notes, bills, checks, treasury bonds, scrip, stocks, &c., &c., to prevent counterfeiting, &c.

2101. Richard Archibald Brooman, of 166, Fleet-street, London, patent-agent. An improvement in, and apparatus for sprinkling substances in a state of powder. A communication from F. H. Ouin.

2105. William Smith, of Salisbury-street, Adelphi, Middlesex, civil engineer. A powerful compound whistle. A communication from Mons. L. Pinel, of Rouen, France.

Dated September 10, 1856.

2106. Henry Cooke, of Manchester, Lancaster, cotton spinner. Certain improvements in dyeing yarns or threads.

2107. Charles William Siemens, of John-street, Adelphi, Middlesex. Improvements in electric telegraphs and apparatus. A communication.

2108. Alexandre Robert, of La Villette, near Paris, France, metal refiner. A new process of treating, smelting, and refining copper, tin, and other refractory metallic ores.

2109. Henry Duncan Preston Cunningham, of Gosport, Hants, esquire. Improvements in reefing sails.

2110. George Riley, of the Grove, South Lambeth, Surrey. An improved mode of treating maize for distilling with apparatus therefor.

2111. Johannes Neuenschwander, of Bern, Switzerland. Certain improved processes of preparing milk to be preserved.

2112. Henry Gilbee, of South-street, Finsbury, London. Improvements in the manufacture of iron. A communication.

2113. John Taylor, of Spring-grove, Hounslow, Middlesex. An improvement in building walls.

2114. Joseph Christian Davidson, of Yalding, Kent, farmer. An improved construction of share drill.

2115. Stephen White, of Newlands-street, Everton, Liverpool, Lancaster, gentleman. An improved method and apparatus for the distillation of certain oils, or oily substances, from the petroleum, commonly called "earth oil," found in certain districts in the Birman Empire, and an improved method of purifying the oils or oily substances so obtained.

2116. Joseph Christian Davidson, of Yalding, Kent, farmer. An improved construction of hop bin or hop frame.

2117. William Webster, of Bunhill-row, Finsbury, Middlesex. Improvements in troughs for feeding animals. Partly a communication.

2118. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in machinery or apparatus for making bricks. A communication from I. Harman, U. S.

2119. William Oldham, of Southam, Warwick, cement manufacturer. Improvements in the manufacture of cement and in treating or preparing coloring matter for cement.

2120. William Henry Forster, of Gravesend, Kent, jeweller. An improved fastening for articles of jewellery, brooches, or dress ornaments.

Dated September 11, 1856.

2121. John Blythe Robinson, of Beverley, York, gentleman. Improvements in machinery for effecting agricultural operations. A communication.

2122. John Gedge, of Wellington-street South, Strand, Middlesex. Improvements in paint or coloring matter applicable to coating metals and other substances, whereby the oxidation of metal is prevented, and resistance to the action of the atmosphere rays of heat or acids is secured. A communication from A. Macpherson, of Brussels.

2123. James Hudson, of Halifax, York, gentleman. Improvements in whetting or setting "printers' doctors" and other straight-edged tools or instruments.

2124. Pier Alberto Balestrini, of Brescia, Italy. Improvements in protecting and laying telegraphic wires.

2125. Richard Atkinson Coward, of Lawrence Pountney-lane, London. Improvements in paddle wheels for propelling vessels. A communication.

2126. John Milnes, of Sutton Mill, Kildwick, York, overlooker, and William Thompson, of Sutton Mill, mechanic. Improvements in looms for weaving.

2127. Lucius E. Truesdell, of Warren, Worcester. An improvement in weight distributing bridges.

2129. Alexander Chaplin, of Glasgow, Lanark, N. B., engineer. Improvements in ships or vessels.

2130. Albert Demerit Bishop, of Hanover House, Maryon-road, Charlton, Kent. Improvements in derricks for raising sunken ships and other heavy bodies from below water, and moving heavy bodies from one place to another.

Dated September 12, 1856.

2132. William Stettinius Clark, of Camden Town, Middlesex. Improvements in hydraulic heaters or furnace. A communication from L. W. Leeds, of Philadelphia, U. S.

2133. John James Leaver, of York-street, Rotherhithe, Surrey, mechanic. An improved pump for pumping, raising, or forcing water or other liquid.

2134. John Talbot Pitman, of Gracechurch-street, London. Improvements in repeating fire-arms. A communication.

2135. Joseph Koronikolski, of Lisle-street, Leicester-square, London. Improvements in baking-ovens.

2136. Henry Dubs, of Warrington, Lancaster, engineer, and Josiah Evans, of Haydock, engineer. Improvements in slide valves.

2137. Edward Paton and Charles Frederick Walsh, of Perth, N. B., gun makers. Improvements in fire-arms and projectiles.

2138. Irénée Leys, of Dunkerque, France. Certain improvements in the preservation of cheese.

2139. George Hutchison, of Hope-street, Glasgow. Improvements in the treatment of oils and fats.

2140. John Elliott, of Southampton, Hants, architect and civil engineer. An improved apparatus for containing and supplying water, gas, and other fluids, applicable also as a fluid meter.

2141. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in treating and purifying water to be used in the washing and scouring of wool, and in other washing and cleansing operations. A communication.

Dated September 13, 1856.

2143. William Whittle, of Smethwick, Stafford, mechanical engineer. New or improved machinery for the manufacture of nails.

2147. Frederic Ducimetière-Monod, chemist, of Marseille, French Empire. Improvements in the manufacture of chlorine.

2149. Christopher Hill, of the G. W. Railway, Chippenham Station. Improvements in the manufacture of lubricating matters.

2151. John Buchanan, of Katrine, Ayr, N. B., gentleman. Improvements in propelling vessels.

Dated September 15, 1856.

2153. John Knowelden, of Southwark, Surrey, engineer. Improvements in the arrangement of valves and apparatus for preventing steam-boiler explosions.

2155. Cornelius Ferguson Clements, of Liverpool. An improvement in separating copper and other metals from ores containing them.

2157. George Cranstoun Trotter Canstoun, of Chirnside-bridge, Berwick, N. B., paper maker, George Young, of Dunse, Berwick, N. B., plumber, and John Lovell, of Chirnside-bridge, Berwick, N. B., paper maker. Improvements in the application of steam for producing a boiling action in bleaching and other manufacturing processes.

2159. Stanislas Chodzko, chemist, of Paris, French Empire. Improvements in the manufacture of manure and the apparatus employed therein.

Dated September 16, 1856.

2161. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improved preparation of phosphoric acid. A communication from E. N. Horsford of Massachusetts, U. S.

2163. Robert Walker, jun., of Buchanan-street, Glasgow. Improvements in ascertaining the draught of water and trim of ships or vessels.

2165. George Tomlinson Bousfield, of Sussex-place, Loughborough-road, Brixton, Surrey. Improvements in power looms for weaving wire cloth. A communication.

2167. John Elliott, of Southampton, Hants, architect and civil engineer. An improvement in taps and cocks.

2169. Robert Mushet, of Coleford, Gloucester, metallurgist. Improvements in smelting of iron ores.

2171. Joseph Gilbert Martien, of Newark, New Jersey, U. S. Improvements in the manufacture of iron.

Dated September 17, 1856.

2173. Charles Marsden, of Kingsland-road, Middlesex, engineer. Improvements in fastenings for shirts and other garments, together with an improved tag.

2175. John Barber, of Manchester, Lancaster, engraver. Improvements in machinery or apparatus for mill and other engraving, punching, dividing, and ruling rollers either for hand or machine engraving, and an improved maundril used in mill, eccentric, and other machinery employed in engraving rollers for printing and embossing calicoes and other fabrics.

2177. William Frederic Spittle, of Birmingham, Warwick, machinist. A new or improved spindle for braiding and plaiting machines.

2179. Carl Heinrich Schröder, of Altona, Holstein, engineer. An improved rotatory engine, to be worked by steam or other elastic fluid, which invention is also applicable as a rotatory pump for raising and forcing liquids.

2181. Friedrich Heinrich Rudolf Scheller, of Vienna, Austria, chemist. An improvement in the manufacture of illuminating gas.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," September 30th, 1856.)

1167. D. Curwood. An improved apparatus for facilitating the cleaning of knives and forks.
1199. R. Pemberton. Improvements in barrel-organs.
1207. G. Heron. Improvements in machinery or apparatus for raising, lowering, moving, or transporting heavy bodies.
1228. J. Howard and G. W. Baker. Improvements in machinery or apparatus applicable to the tilling of land.
1229. T. D. Russum. A new or improved brake for steam engines and other motive power engines.
1232. J. Gedge. Improvements in looms. A communication.
1237. J. Gedge. Improvements in the application of distillation to gas from the furnaces of steam engines. A communication.
1238. G. B. Galloway. Improvements in the furnaces of marine boilers and in the construction of steam vessels.
1246. R. A. Whytlaw and A. Mitchell, jun. Improvements in weaving.
1256. B. J. Heywood. Improvements in holders for leads, slate and other marking materials.
1282. J. Weems and J. H. McCrindell. Improvements in the manufacture or working of metals and their ores.
1318. J. H. Johnson. Improvements in oil cans employed in lubricating machinery. A communication.
1382. W. Wilson. Improvements in machinery for pulling the hair from coney and other skins. Partly a communication.
1416. J. Sutcliffe and J. Leech. Improvements in machinery or apparatus for opening, cleaning, and preparing cotton, wool, and other fibrous substances.
1418. E. Guérin. A self-acting apparatus for working railway brakes.
1760. C. T. Judkins. An improved gas-regulator.
2027. T. P. Hawkins. A new or improved manufacture of wire chain.
2046. E. P. Spiller. Improvements in the construction of chamber lamps.
2051. J. Morrison and S. Amphlet. A new or improved fastening for belts, bands, and other such like articles.
2054. E. Leigh and G. P. Leigh. Improvements in parts of machinery or apparatus used in preparing and spinning cotton, and other fibrous substances.
2095. W. Petrie. Improvements in the manufacture of sulphuric acid and the apparatus employed therein, parts of which improvements are applicable to the manufacture of nitric, hydrochloric, and other acids.
2097. J. Watson and C. F. Halle. Improvements in spinning or twisting fibrous materials.
2102. C. Brook, jun. An improvement in polishing or finishing yarns, threads, and woven fabrics.
2109. H. D. P. Cunningham. Improvements in reefing sails.
2117. W. Webster. Improvements in troughs for feeding animals. Partly a communication.
2118. J. H. Johnson. Improvements in machinery or apparatus for making bricks. A communication.
2119. W. Oldham. Improvements in the manufacture of cement and in treating or preparing coloring matter for cements.
2125. R. A. Coward. Improvements in paddle wheels for propelling vessels. A communication.
2129. A. Chaplin. Improvements in ships or vessels.
2136. H. Dube and J. Evans. Improvements in slide valves.
2139. G. Hutchison. Improvements in the treatment of oils and fats.
2147. F. Ducimitière-Monod. Improvements in the manufacture of chlorine.
2159. S. Chodzko. Improvements in the manufacture of manure and the apparatus employed therein.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

2197. James Leetch.
2210. Joseph Ellisdon.
2216. William Prior Sharp, John Hill, jun., and William Martin.
2258. William Henry Wilding.
2277. Samuel Leake Worth and Agmond Dishin Vesey Canavan.
2293. James Bullough, John Walmsley, and David Whittaker.
2312. Henry Clayton.
2319. Frederick Warner and John Shotton.

LIST OF SEALED PATENTS.

Sealed September 26, 1856.

719. William Armand Gilbee.
727. William Clayton.
733. Richard Durant Cumming.
734. Bonnet Frédéric Brunel.
736. William Ball.
737. Allen Levinston Hill.
744. Alfred Daniel.
746. John Charritie and William Smith.
753. Charles Wye Williams.
760. Herbert Newton Penrice.
769. James Hicks.
778. George Thomas Smith and Joel Watts.
802. Alfred Vincent Newton.
818. Charles William Ramié.
820. Joseph Gilbert Martien.
834. Henry Craigie.
844. William Coles Fuller.
858. Richard Chrimes.
867. Thomas Williams Makin and John Barnsley.
924. John Marsh.
1152. Hugh Greaves.
1202. John Cope.
1436. Walter Henry Tucker.
1446. George Pye.
1484. Leonard Bower.
1582. Thomas Smith.
1601. William Youtman.
1781. Samuel Yeadon and George Chapman.

Sealed September 30, 1856.

780. Joseph Bentley.
792. Richard Roberts.

793. Peter McGregor, and Thomas Marquis.
794. James Smith Cottrill.
796. George Bell Galloway.
808. Thomas White, jun.
822. James Hogg and John Napier.
825. James Webster.
829. Henry Thomas Sturley.
831. William Porter Maddison.
838. John Leigh.
870. Peter Armand Lecomte de Fontainemoreau.
889. Samuel Cunliffe Lister.
891. Samuel Cunliffe Lister.
894. Alfred Vincent Newton.
920. John Skirrow Wright.
921. George Lurig.
959. Augustin Simeon Vimont.
994. Charles Swift and John James Derham.
997. Robert Lakin, John Thompson, Edward Gerrard Fitton, and Frederick Alexander Fitton.
1195. William Edward Newton.
1291. Robert Jobson.
1357. Alfred Vincent Newton.
1444. Guilford Lindsay Molesworth.
1594. James Horsfall.
1667. George Tomlinson Bousfield.
1757. George Tomlinson Bousfield.
1854. John Yuil Borland.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICE TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine*, must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

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LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1731.] SATURDAY, OCTOBER 11, 1856. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

MUIR'S IMPROVED SLIDE-LATHES.

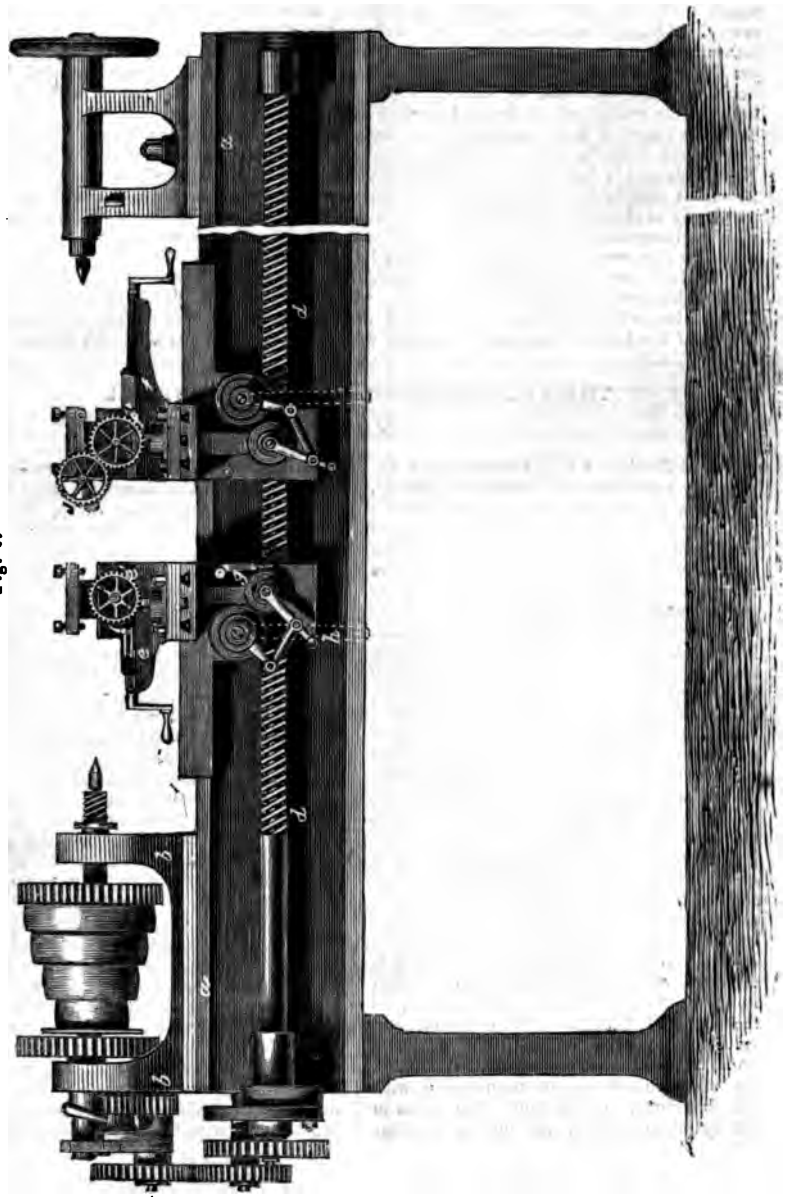


Fig. 1.

MUIR'S IMPROVED SLIDE-LATHES.

Mr. William Muir, of the Britannia Works, Manchester, whose engineering machines are well known throughout the country, has just patented the application of an additional slide rest, or more than one, to slide lathes of the ordinary construction, to economize time and labour in turning or screw-cutting.

Fig. 1 (preceding page) is an elevation of a slide lathe of the ordinary construction, to which his improvements are applied; and fig. 2 (opposite page) is an end view. *a* represents the bed of the slide lathe; *b*, the fast headstock; *c*, the loose headstock; and *d*, the screw by which motion is communicated to the ordinary slide rest, *e*, and to the additional slide rest, *f*. Although only one additional slide rest is shown, it is evident that in long slide lathes two or more additional slide rests may be employed. In fig. 1 the rests, *e* and *f*, are shown at a certain distance apart. When close together they are connected by the hook, *g*. The workman, by turning either of the handles, *h*, can regulate the distance between the rests, each of the said handles being in connection with a pinion taking into the main screw, *d*, in the usual manner; but as soon as the distance between the rests is determined, both the rests are moved simultaneously along the bed by the main screw, *d*. Each slide rest is furnished with a back stay and with a cutting tool, as shown at *i*, in fig. 2; and as each tool is capable of being adjusted laterally and for the depth of the cut independently of the other or others, it is evident that in turning or sliding a shaft the first tool will be giving the rough cut, while the other or others is or are performing the finishing cut. By this means a considerable saving in time and labour is effected.

Mr. Muir also shows a modification particularly applicable for screw cutting, in which the tool holders are connected by a pinion, which revolves on a stud fixed to the slide rest. This pinion, when the rests are connected together, gears into two pinions attached to the screws of the tool holders; consequently, when the attendant turns round either of the

---

THE VULCANIZATION OF INDIA RUBBER.

No. V.

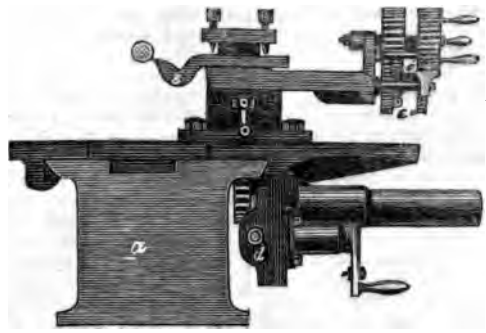
The difficulties which surround and oppose any new discovery, however important, are not always to be attributed solely to the jealousy of individuals, or the working of combined influences operating either systematically or blindly upon all and everything which may appear to come into antagonism with presumed rights or vested interests. The greater portion of an impeding circumstance, either negative or positive, too often arises from a want of knowledge of the thing itself, its nature and its capabilities. In no one thing is this perhaps more manifest than in that portion of the discovery of vulcanized India-rubber known under the term "Hard." In the hands of one man it is all and everything: he can do what he will with it. In those of another, it becomes stubborn and unruly.

For instance, a die-sinker shall take a circular blank of vulcanite, and after softening it by the application of great heat, he shall place it beneath the most powerful of his presses, and all the accustomed force of himself and men shall not attain an impression, or if one at all, it shall be such as shall "crawl back," so to speak, to the original flatness of the blank, and leave not a trace behind. Yet one who understands the substance shall take just the same course as the uninitiated, with this difference, that he causes the press to act by pressure only, and not by percussion, and he retains such pressure for a few moments while the substance sets; and the consequence is, the most sharp, deep, and indelible of results. The rapidity with which medals in metal are struck is known to most persons. The fact, that time, however slight, is necessary to set the vulcanite, may operate in the minds of some persons to the prejudice of the material. This waste of time, is, however, obviated in the new machinery provided for the working of vulcanized India-rubber, medallions, &c., by the aid of alternate hot and cold appliances, which are amply compensated for by the smallness of the apparatus, and the simplicity and directness of the power required.

The button trade, as at present pursued, is said by many to be as simple as it can be; yet there are features in the process of making vulcanite buttons which appear to us to simplify simplicity. To enter into a detail of the latter methods would perhaps be not only premature, but unfair to those to whom they are due; and as the secrets attached to them appear to belong to those who are about to use such contrivances, we shall wait the permission of those most concerned, or at least the security by law of the systems, before we make them public. Suffice it to say, that buttons of most descriptions and shapes can be made more rapidly than by the ordinary process, and with this great advantage, that

latter pinions, the requisite motion for regulating the depth of the cut or for inserting or withdrawing the tools is performed simultaneously. The depth of the cut is capable of being adjusted in each tool independently of the other by a worm and worm wheel. The

Fig. 2.



worm on being turned round gives motion to the worm wheel, which is fast on the screw acting on the tool holder; consequently, by turning the said screw round, the depth of the cut is increased or diminished.

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the vulcanite acquires finish in the first and normal stages of its manufacture.

This "face" or finish is obtained by the metal dies to which it is opposed. A sheet of the soft material pressed by tin-foil, upon the latter of which is a pattern of any kind, and then subjected to the vulcanizing process, will, after a short period, on the removal of the tin-foil, present a perfectly finished appearance. Wherever the foil is smooth, there will be a high and brilliant polish, and the rough portions of the pattern and its complex character will be as faithfully transferred.

The educational section of both the soft and the hard divisions of vulcanite deserve especial mention. For maps, which cannot be torn or otherwise destroyed; for globes, which, when required, may be made to assume a perfectly spheroidal shape, and when not, may be folded to put in the pocket, or packed away as readily as a night-cap; for parallel rulers, flat architectural and geometrical paraphernalia of every form; for imitation slate, upon which black lead will mark grey, and be capable of removal by a dry application of the finger or cloth; and for an almost endless variety of other things bearing either directly or indirectly on education or its further development, this material, on a careful inspection of examples, appears to us to be singularly fitted.

In its hard stage it neither shrinks nor warps, as does wood; and while as clean and smooth as ivory, it is not so liable to be—indeed it cannot be—split. We do not say that those things made in the hard material cannot be broken. This would be claiming for it more than its due; but, from what we know of it, and from various experiments and tests we have made and subjected it to, we feel authorized in saying that almost, if not all those materials for which it is intended as a substitute, possess not one tithe the tenacity or immunity from destruction, whatever such may be, as do those of the vulcanite.

Some specimens of handles of knives, made by Mr. Moseley, the cutler, of London, have recently been shown to us of surpassing beauty. Those formed in a raised lozenge pattern, with points of steel or brass inlaid on the apex of each diamond, are particularly pleasing to the eye, and suggestive of a firm grip to the hand. The imitations of carved oak for the handles of dinner-and other knives, are likewise worthy of remark, and not the less so as they will, one and all, stand the ills which knives are heir to, and that, amongst others, of the culinary ordeal of hot water, which separates many an ordinary blade from his otherwise attached better haft. The finest stag-horn is likewise imitated, and it must be obvious that the very best specimen of antler can be as readily and as cheaply multiplied as an inferior description.

Many of the specimens of hollow ware exhibited to us were moulded by a process as simple as it is interesting. An iron or brass mould being made—say of a powder-flask, a bottle, or a gun-stock—thin sheets of the material, in a soft and plastic state, are placed within it, and with these sheets more or less water, as the case may be. The mould is then hermetically closed, and subjected to heat, which generates steam, and the natural pressure of the latter, equal

on all sides, forces the material into the crevices and crannies of the mould, and after vulcanization, and a few minutes' subjection to a buffer wheel for extra polish, the work is done. Thus articles as small as beads and the handles of shaving-brushes up to the largest kinds of things, partaking more or less of a hollow character, are formed with singular facility and correctness.

The lightness of these hollow articles is no less remarkable, the more so when their strength is made manifest. This element of lightness is convincingly shown in the various applications of vulcanite to the kit of a sportsman, and the useful and decorato portions of the accoutrements of the soldier. By the employment of vulcanite for nearly all those portions of the costume of the soldier more than one-third, and, in some regiments, one-half the weight now endured would be dispensed with, and this at no sacrifice whatever of either durability or appearance.

The utensils made of vulcanite are exceedingly light and portable. There are ewers, basins, jugs, cups, saucers, &c., at the Crystal Palace Vulcanite Court, which, with even more than the ordinary usage, would last for centuries. Half a dozen pails made of it may be carried by a child with the greatest ease; and we all know, or ought to know, the large proportion that an ordinary wood and iron hooped pail bears to the weight of the liquid it may have to hold. For lightness, combined with strength, it possesses no equal, unless we except some of the gourd kind of bowls and cups used by uncivilized tribes; but these are of course arbitrary in their shape, and very difficult to beautify; whereas any impress may be given to the vulcanite in the mould, some parts coming out with a smooth and brilliant polish, and others in dull relief, according to the design of the maker.

TAYLOR AND CRANSTOUN'S RAILWAY COUPLING APPARATUS.

It is not to be supposed that while railways exist, railway accidents will ever wholly cease to occur. Occasional mishaps, resulting either from the imperfection of men, or from the imperfection of the material which they employ, must be considered inevitable in all large mechanical operations. But intelligent men observe a broad distinction between occurrences which are purely *accidental*, and others which result from prejudice, indifference, or parsimony on the part of railway companies.

Now it is to one or more of these defects in railway companies, or in those who manage *such* companies, that the deaths of a large number of railway servants who are annually crushed in the act of coupling railway carriages or waggons, are to be attributed. If no apparatus capable of effecting this coupling in a simple, inexpensive, and efficient manner had been invented we should not, of course, make this unqualified statement. But such an apparatus having been introduced and practically tested with complete success, we are bound to place the responsibility where we have indicated.

The mechanical contrivance here alluded to was described at some length in our number for September 13, (No. 1727,) but in order to place the nature of it fully and clearly before the reader we propose now to add a few further remarks respecting it. It is the invention of Mr. C. D. Cranstoun, the manager, and Mr. Taylor the local engineer, of the Morayshire railway. Though not the only arrangement that has been designed with the same object, *it was the first*, and has the important merits of being light, cheap, easily worked, and perfectly efficient.

In the engravings at page 247 three links are shown at each end of the carriage —one central draw link and two side links. The inventors consider the two side links superfluous, and only put them there to satisfy such parties as consider side chains (in the existing system) indispensable. Only one central draw link is used on the Morayshire line, where, as was before stated, the system is in operation. If the side links were dispensed with, the cost of adopting the improved system would be no greater than that of the system at present in general use. It might indeed be considered that it would be attended with danger to run trains with only one draw link. This objection has, however, been entirely obviated by a very simple, yet complete contrivance. It is as follows: as all the carriages and waggons have a draw link at each end (the link being passed through the eye of the draw hook), it follows, that when the carriage or waggons are connected, there will be a spare link hanging vertically from each. This link, by a simple movement of the lever handles, is thrown over a service hook which is suspended from the transverse shaft, as shown in fig. 1 of the annexed engravings, in which *a* is the draw link, *b* the spare link, *c c* are the service hooks, *d d* the lifting levers, *e e* the lever handles, *f f* the draw hooks, and *g g* chains for moving the service hooks. The service hook hangs loosely but is perfectly secure, and therefore should the draw link break, the spare link would at once be brought into action, and assume the position of the draw link. Hence the necessity of side links (in lieu of side chains) is entirely

obviated. Practically considered, this is in every respect preferable to side links, inasmuch as the *draw* would, under every circumstance, lie in the centre of the train. Several railway companies dispense with the use of side chains, as they have found, from experience that, should the centre or draw *shackle* break, they have a tendency to draw the carriages or waggons off the line.

The improved system obviates all the defects of the existing system of coupling. We will briefly particularize some of these:

First. The lives of railway servants are always endangered from having to pass betwixt the carriages and waggons to couple or uncouple them, which fact is well substantiated by the number that are killed and injured yearly from being crushed between the buffers, and from being thrown down while between the carriages or waggons. Messrs. Taylor and Cranstoun's system precludes the possibility of such accidents, as the actions of coupling and uncoupling are completely performed by a simple movement of either lever handle *at the side* of the carriages or waggons.

Secondly. Accidents are continually occurring to passenger trains from the carriages becoming disconnected on the journey. This arises from the defective character of the screw coupling at present in use (which is a straight bar with short joint links at each end). When compression of the buffers takes place, it has a tendency to throw the short links over the draw hook, thereby disconnecting the carriages. Several fatal and expensive accidents have arisen from this defect. The new system, however, entirely obviates it. From the

Fig. 1.

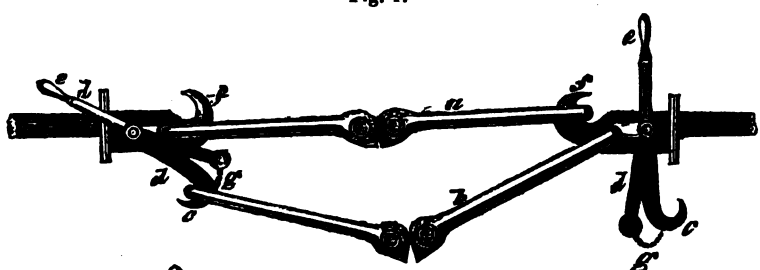
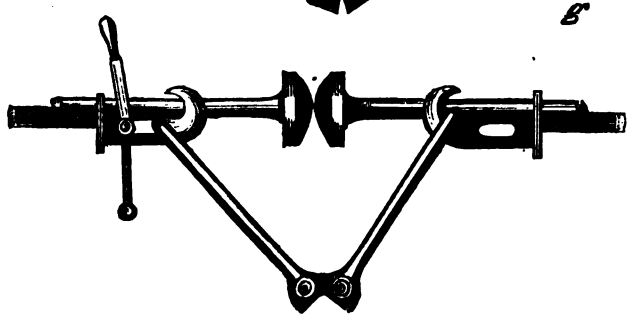


Fig. 2.



construction of the centre joint of the link, the greater the compression of the buffers, the more secure the link becomes. Fig. 2, shows the position of the draw link when the buffers are compressed. The link has always a downward folding tendency, that is, a tendency to assume the form of the letter V when not straightened by drawing.

The invention possesses another important advantage, namely, a *saving of time*. It may be said to be *instantaneous* in its action, and the annual value of the time saved would be immense. We have computed that, were it *in general use throughout* the kingdom, the aggregate saving of time would not be much short of from 1,000 to 1,200 hours *daily*.

It has been stated, as an objection, that the centre joint of the link would soon get filled with dirt, so as to impede its action; but this is a fallacy, for some of the links have been in use nearly two years without being cleaned, and the action is as perfect as when they were first put on.

Having thus fully made known the nature of this invention, designed and introduced for the express purpose of avoiding one entire and very dreadful class of railway accidents, we ask whether railway

companies are justified in refusing even to entertain proposals for its adoption? For our own part, we hold that by so doing they make themselves accountable, in all right and justice, for every injury or death that hereafter results from the present dangerous and destructive method of carriage-coupling. The Board of Trade have the invention under their consideration; but why do they not do more than *consider* it? Life and limb are at stake, and the public have a right to expect that the Board shall promptly pass to decisive action in the matter. Meantime, the invention must be viewed as a test for railway companies. Here is an opportunity for them to give their servants and others security with but little or no effort, either pecuniary or otherwise. If they fail to give that security, in place of the existing danger, we can esteem them as no other than reckless of the lives committed to their trust.

THE NEW AMERICAN STEAM SHIPS OF WAR.

THE visit of the large American steam frigate *Merrimac* to Southampton having occasioned considerable interest, we think it may now be a proper time to lay before our readers such information as we have from time to time obtained respecting her, and the *Wabash*, the *Minnesota*, the *Roanoke*, and the *Colorada*—four ships of much the same size and power as the *Merrimac*—and also respecting the huge steam corvette the *Niagara*. In order to render the information which follows perfectly reliable—in so far, at least, as the *Merrimac* is concerned—we have visited that vessel, and verified by personal observation the facts hereafter stated. In making this verification we were favoured with the utmost courtesy and co-operation on the part of the officers of the ship, and particularly of First Lieutenant G. W. Harrison, who was in command of her at the time of our visit, and to whose kindness we are much indebted.

The principal dimensions of the five frigates above enumerated are so nearly alike that they may, for all ordinary purposes, be considered the same, and may be taken as follows;—*

	feet	ins.
Length on keel	250	0
Length on load water line	260	0
Length over all	300	0
Breadth extreme	51	4
Breadth moulded	50	2
Depth of hold (to gun deck)	26	4
Draught of water, forward	23	6
Draught of water aft	24	0

As our examination of the *Merrimac* was made for the purpose of estimating her merits as a ship of war, we must add to the above the following details which are of importance in such a ship. When the vessel is at her load line, the heights of the gun deck ports above the water are amidships 9 feet, and forward and aft 12 feet, or thereabouts. The height from her gun deck to the lower sides of her spar deck beams is 6 feet. The height of her bulwarks is such that, when the hammocks are stowed they reach 8 feet 8 inches above the upper deck. Her gun deck ports are 3 feet 8 inches long, and nearly 8 feet 6 inches apart. Her load displacement is estimated at 4000 tons; but this we could not, of course, test.

The *Merrimac* was designed by Mr. Lenthall, who is at the head of the Bureau at Washington,† and was built by Mr. Delano, the master shipwright of the Navy Yard at Boston, (or the officer who corresponds to a master shipwright of our own dockyards.) Her frame is of live oak, crossed on the inside with two sets of diagonal iron plates which are inclined in opposite directions. She is also strengthened by similar plates on the outside at bow and stern. Her plank is also of oak, and, like our own ships of war, she is copper-fastened up to a few feet above the load water line. Her decks are of fir. On a careful inspection, she seems to have been built with very great skill and

* Almost the only difference between the dimensions of these five frigates is a slight one in their lengths. But this is a difference of about 5 feet or six feet only at most. The *Wabash* is said to be 5 feet 8 inches longer than the *Merrimac*; but even this is true only when the length is measured at the load line.

It may be well to state here that we are in possession of numerous statistics relating to these ships, which we have not thought it necessary to give, because they can only be of use to the *constructors of ships of war*, who do not trust to *scientific journals for the elements of foreign vessels*. We see no utility in publishing, in isolated cases, such quantities as the height of the metacentre, and the moment of stability, for instance. We consider that their publication, under such circumstances, is always pedantic, and are confident that they are frequently given in absurd forms. Only recently we saw in a contemporary, among the statistics of the *Niagara* these words:—"Movements of stability ($8\frac{1}{2}$ y' ax), 2,415,560 sq. ft." This was probably intended to be "Moment of Stability ($\frac{1}{2}\int y^3\,dx$), 2,415,560." But even this is, of course, wrong; every naval architect knows that the quantity $\frac{1}{2}\int y^3\,dx$ is not the moment of stability, but the moment of inertia of the load water section.

† The four sister ships were also designed by Mr. Lenthall. The American *Nautical Magazine* says, "In the appropriation for these six auxiliary steamers there was one prominent exception. Congress determined that one of these ships should be constructed by a private builder, and Mr. George Steers, the constructor of the yacht *America*, was entrusted with her construction; while the other five were left in the hands of the Bureau of Construction, perhaps that their models might indicate their origin."

care, and is a very tight strong ship. The large wooden knees (common in American ships because more approved of, and more readily obtained than iron) to some extent interfere with the beauty of her appearance inboard. But she is a very roomy and handsome ship, and the appearance of her main deck is unsurpassed.

With all her sails set, she spreads 56,629 square feet of canvass. Her engines are auxiliary only. Her rig is in all respects like that of the largest American sailing frigates, but from her great length she seems capable of carrying masts, spars, and sails even larger than those she has. The mode in which the mainmast steps is worthy of attention. The shaft of the propeller coming immediately beneath it, (since the engines are before the mainmast), a step is formed to receive it above the shaft. This step consists of a large thwartship beam of live oak, supported near the middle by two 12-inch solid iron columns which rest upon suitable keelsons. This arrangement is perhaps as good as any other, although the strength attending it must certainly be much less than that in which the mast steps in a wooden step supported immediately by the keelsons themselves, as is the case where no screw shaft interferes. The modes adopted in our own navy are various. In some cases tall iron forked steps, which stride across the shaft are employed, and in others the heel of the mast itself is enlarged, and the shaft allowed to pass through it, the lower piece of the mast being separable from the upper, and connected with it by clasp jointed hoops.

The *Merrimac* is pierced for 60 guns, but if she were actually to carry that number they would have to be of a lighter character than those now on board of her. Her present armament is as follows:—On her upper deck there are two large pivot guns, each weighing nearly 5½ tons, and of 10 inches bore, and fourteen 8-inch guns, each weighing rather more than 3 tons; on her gun deck there are twenty-four 9-inch guns, each weighing nearly 4½ tons. The whole of these guns, forty in all, though strong enough to discharge solid shot, if desired, are primarily intended to be served with hollow shot, or with shell,—for it is now a practice with the Americans to supply their navy with a quantity of empty hollow shot, which may be either plugged and used as such, or charged, fitted with fuzes, and used as shells. We must not, however, omit to mention that she might carry a few additional 9-inch guns on the main deck with perfect convenience. Her gun carriages on the main deck are similar to those used in the French navy. They have, however, but two wheels or trucks each, at the ship's side end of the carriage. To facilitate the running out of the gun the rear end of the carriage is raised by a handspike fitted with a roller at the end, on which roller the carriage runs out. At the upper side of this handspike roller is a pin or stud which takes into one or other of a series of recesses formed in a plate on the underside of the rear end of the carriage. The carriage slides of the large pivot guns differ from our own chiefly in the fact that they are furnished at each end with wheels or trucks (which run on the metal circular bearing plates on the deck) mounted on eccentric axles. These axles are turned by a spanner, so as either to take the weight of the slide and allow it to be run round upon them, or to be raised clear of the bottom of the slide, and allow it to rest immediately upon the deck plates. The carriages which run upon the slides have their rear trucks mounted upon similar eccentric axles. The friction of the carriage upon the slide when the piece is to be discharged (and when the trucks are clear of the slide) is sometimes increased by nipping the two together with screws.

The whole of the 9-in. guns, or main-deck guns, as well as the two 10-inch pivot guns, are formed upon Commander Dahlgren's system, which consists in giving to the gun, at each point of its length, a thickness proportioned to the direct pressure of the powder in the chase at that point, supposing the gun to be fired with an ordinary service charge. In order to carry out that principle, Commander (at the time Lieutenant) Dahlgren took an ordinary Paixhan gun, and had bored in it a number of holes, each of the size of a musket ball, extending from the outside of the gun through into the chase. These holes were perpendicular to the axis of the gun. A musket ball was then placed in the first hole (the remainder of the holes being plugged for the time), the gun fired with a service charge, and the initial velocity communicated to the musket ball measured by a ballistic pendulum. This was repeated with each hole successively, and lines representing the initial velocities thus obtained were taken as the ordinates of a curve (of which the distances apart of the holes represented the abscissæ), and this curve gave the contour of the exterior of the gun. The Dahlgren guns are of greatly reduced thickness along the chase, and suddenly increase their thickness near the breech, where the great bulk of the metal of the gun is collected. Before the adoption of them in their navy, the American government had them severely tested, with highly satisfactory results. Without doubt, the principle of Commander Dahlgren is correct, so far as it goes. There

are also collateral advantages connected with the adoption of it in naval ordnance, one of which is that the centre of gravity of each side battery is, owing to the form of the guns, thereby brought nearer to the middle of the ship, which must tend to make her roll less heavily than otherwise. Each gun is furnished with two lock-lugs, or lugs for the gun-lock—one for use, and one to supply its place if it should be knocked away.

There are a few other novel features in connection with the guns of the *Merrimac*. One is that her guns are fitted with elevating screws, which supply the place of the *coin*, &c., in our own service. This arrangement tends greatly to facilitate the sighting, and is certainly an improvement, provided that it is not attended with any defect in strength, and we were assured that none had been observed during considerable practice. Another new feature is the employment of bristles, instead of sheepskin, in all the sponges and rammers for the guns; and a further one is the employment, for boat guns, of light and elegant wrought iron carriages, of which she has three, one for a 9-pounder, a second for a 12-pounder, and a third for a 24-pounder.

The engines of the *Merrimac* are by Mr. Parrott, of the Cold Springs Foundry, New York. She has two cylinders 72 inches in diameter, and 3 feet stroke. These are placed close to the shaft, on opposite sides of it, leaving room only for the crank. Each piston has two piston-rods, one above and one below the shaft; these carry a cross-head from which the connecting rod reaches back to the crank, as is well understood by engineers. Each cylinder has its condenser at the side of it, and its air-pump opposite to it. The air-pump rods go through the cylinder ends direct to the piston. She is fitted with four of the vertical tubular boilers patented by Mr. D. B. Martin, Engineer-in-chief of the U. S. Navy, similar to those fitted previously in the *Susquehanna*, by Merrick and Son, of Philadelphia. The boilers are of iron, with brass tubes, and have the following general dimensions:

Length of each boiler, athwartships, 11 ft.; breadth, fore and aft, 14·8 ft.; length of vessel occupied by four boilers, 31 ft. 8 ins.; breadth of ditto, and fire-room, 31 ft. The fire-room is between the two pair of boilers, the furnaces firing athwartships, and the flues delivering into one chimney. Height of boilers, 13 feet 6 inches; cubical space occupied by all the boilers and fire-room, being the content of a parallelopipedon included within the above circumscribing lines, 13,240 cubic feet; number of furnaces in all boilers, sixteen; breadth of ditto, each, 2 feet 10½ inches; length of ditto, each, 7 feet; grate surface area in all, 338 square feet; number of tubes in all boilers, 5,480; length (or height) 37¾ inches; diameter (outside) of the tubes, 2 inches; heating surface in furnaces and back connections up to tubes, 1,614 square feet; heating surface in tubes, 8,508 square feet; heating surface in tube-boxes and connections to smoke chimney, 1,581 square feet; total heating surface in all boilers, 11,703 square feet; proportion of the same to grate area, 34·6 to 1·00; flue area or calorimeter between tubes in all boilers, 42 square feet; proportion of the same to grate area, 1 to 8 square feet; diameter of smoke chimney, 8 feet.

The boilers all have water-bottoms, with not less than 6 inches of water-space at any point; back of the furnaces these bottoms rise to the back connections; the tube-boxes are above the furnaces, and rise about 3 inches to the front end of the boiler, where they enter the front connections. The boilers are of 3-8th inch, and ½ inch best American plates, double riveted and caulked inside and out, throughout, and are well braced. The weight of all four, when empty, is 255,000 lbs. Their total weight, when filled to the working level, is 440,000 lbs.

To test the economical evaporative efficiency of this form of boiler, an experiment was made on the 13th of March last, in the presence of several engineers of the navy, the conditions and results of which were, as published by Mr. Merrick, the maker, as follow:

Two boilers only were used, and the dampers were nearly closed.

The coal used was anthracite, and of an inferior quality. The engines are fitted with Stevens' cut-off, which was adjusted and permanently fixed to cut off as follows:

Port engine, one end	3·88
,, ,, ...	4·12
Starboard engine, one end	4·60
,, ,, ...	3·35
Average per indicator-card, with full throttle.....	3·97 feet.
Adding to this the average clearance at each end of the cylinder, and including, also, the steam-passage, &c., between valves and cylinder, equal to 23·820 cubic inches, or the area of the cylinder by 6·05 inches* of stroke, or....	·504 feet
Average length of cylinder, filled at each single stroke..	4·474 feet

* This enormous amount is taken from actual measurement, and is stated to be, in a great measure, incident to the form of engines (inclined) with which the ship is supplied.

Preserving the same level of water in the boilers, and (as nearly as could be ascertained) the same quantity of coal in the furnace, or about the same fires, and maintaining the same pressure of steam, 4,200 lbs. of coal were consumed, and 1,615 revolutions made and noted by register, the duration of the experiment being 3 hours 57 minutes. During this time eleven double cards were taken on the two engines, which showed a mean pressure of steam entering the cylinders, during that part of the stroke over which steam was admitted of—

Total pressure—Port engine, 18·99 lbs.; starboard engine, 21·81 lbs., of which (Pambour) the volume is 1,257.

Hence, the water evaporated during the experiment was as follows: the two cylinders being 70 inches diameter = 26·41 square feet of area.

$$\frac{26{\cdot}71 \times 4{\cdot}474 \times 1{,}615 \times 4 \times 62{\cdot}5}{1{,}257} = 39{,}372 \text{ lbs. of water,}$$

which, being evaporated by 4,200 lbs. of coal, gave 9,137 lbs. of water per lb. of fuel.

The temperature of the hot-well was 89½°, and of the feed-water entering the boiler at (probably) 85°. The evaporative power of the boilers will at once be seen from the above figures of Mr. Merrick. In the *Merrimac* very excellent results have also been obtained with Mr. Martin's boilers. Her coal bunkers carry about 600 tons of coal. A small pair of donkey engines are provided on the main deck for coaling, raising heavy weights on board, &c. These auxiliary engines have a suitable boiler to supply them when the main boilers are not at work. Two steam pumps are fitted in connection with the large engines for pumping out the bilge, extinguishing fires, &c. These steam pumps may be supplied with steam from the auxiliary boiler, if desired. The *Merrimac* is fitted with a Griffith's screw propeller, with means of varying the pitch. In this respect she differs from her sister ships, all of which have ordinary propellers. The *Niagara* is, we understand, to have a Griffith's.

The propelling arrangements on board the *Merrimac* are very complete. The forward thrust is taken by a series of collars, and the backward thrust by a brass disc dropped down between the end of the propeller bearing and the after sternpost. This disc may be readily renewed when worn. The shaft is supported between the engines and the dead wood by bearings and intermediate spring supports, and a cooling pipe is led from the outside of the ship over each. The after propeller bearings are of wood, upon Penn's principle. The propeller is raised by a cable and pulleys, the cable leading to the capstan. A long wooden stay, tightened by a screw, is used for keeping the propeller down in its place, and suitable means are also provided for steadying the propeller during the raising of it, for slinging it when raised, or partially raised, &c.

The greatest speed ever attained by the *Merrimac* under steam alone was seven knots per hour, and this was made under very favourable circumstances. Her average steaming speed is much less than this. There are, however, certain defects in connection with her slide-valves which prevent the full and most economical results being attained with her engines. The lap and lead was so small, that at first she could not cut off her steam until 19 ins. of her stroke: she will, for the future, owing to improvements made on board, cut off at 15 ins. But radical changes must be made in her valves before the necessary economy is obtained. The details of the engines—the driving gear, &c.,—are very well arranged.

The *Merrimac* is full of evidences that the American Government are willing to give trial to improvements of a promising character in their ships of war, notwithstanding the changes which their introduction renders necessary. At the same time there are arrangements, which have been proved highly valuable in our own service, unadopted by them. For example, instead of the admirable lightning conductors of Sir W. Snow Harris, used with so much advantage by us, the old bit of chain long discarded here, lies down against her shrouds, and gives great offence to the eye of the intelligent visitor. But, on the whole, the useful improvements greatly out-number the defects. This we might show at great length if we thought it desirable. It will, however, be sufficient to add a further fact or two. The fish-davit is centered on a hoop on the foremast, and may be swung over either anchor for fishing it, and may also be used to assist in the removal of the heavy berthing which has to be taken down when the bow pivot gun is used. Both operations may be performed by steam power derived from the auxiliary engines. Another useful arrangement is the use of a hinged tongue-piece, which may be pressed down between the links of the cable by a screw when the cable has to be fleeted. Another is the employment of light bulkheads around the engine-room hatches on the main deck. Whether the absence of all mess tables for the ship's crew is an improvement or an act of retrogression we leave naval officers to decide.

In our next number we shall probably publish a few further statements respecting the *Merrimac*. At the same time, we believe

that the points of chief importance are included in the above remarks.

The *Niagara* is built, we are told, as an experiment; and it is perfectly certain that if she should prove a thoroughly strong and efficient ship of war, she will surprise every one who has hitherto been considered well informed on the nature and requirements of war ships. The history of this ship's origin is simply this:—Mr. Steers, of New York, built the *America* yacht, which proved to be a very fast one. This gained him reputation and friends, and secured him orders for constructing various other vessels of larger sizes. He succeeded in building more than one fast and serviceable commercial steam ship, and when the American government resolved upon making a demonstration with large steam ships of war, Mr. Steers, or the friends of Mr. Steers, succeeded in getting the design and construction of one committed to him. Mr. Steers knew but little, if anything, practically of ships of war; and, if we are rightly informed, cared to know but little of them, except what the light of nature supplied him with, for, we are told, he availed himself but very little of the freedom with which he was permitted to have access to the Bureau of Construction and all that it contained. More than one professional American gentleman has spoken to us strongly upon this point. "It was but reasonable," says the United States *Nautical Magazine*, "to suppose that every facility would be afforded Mr. Steers, now that improvement seemed to be really intended, and, with the exception of the propelling power in the quantity of canvass, the ground tackle in the kind of anchors, and the ventilation in the improved side-lights he has thought proper to use, he has been allowed to exercise his own judgment, both in the model and manner of construction, and is, like the constructor of the *Ohio*, quite willing to take the whole measure of responsibility, having a full knowledge of its weight and bulk. This vessel, as her dimensions and calculations will show, is the largest of the six, and is also of a very different model and construction. In the construction of the *Niagara* it is alleged that there are principles involved which are of great importance to the safety of vessels, which have never been appreciated in the navy, either in this country or elsewhere. It was supposed that in the model and internal arrangements alone would this vessel differ from the other five vessels; but it is discoverable that not only is the form of the fabric and her arrangements in armament different, but that the manner of distributing the materials throughout the vessel is also entirely different, utility being regarded as of more consequence than the time-honoured precedents, the constructor having sought to secure the greatest amount of strength with the least bulk."

The principal dimensions of the *Niagara* are as follows:—

	ft.	in.
Length on load-water line ..	328	10
,, over all.....	345	0
Breadth extreme	55	0
,, moulded	53	8
Depth of hold to spar deck..	51	3
Draught of water.....	26	0

Her ports are 15 feet above the load-water line. Her height between decks is 7 feet 3 inches to the under side of beams! Her displacement at 23 feet draught is 5,440 tons. Her frame is of live oak, filled in below with yellow pine, and crossed on the *outside* with two sets of diagonal iron plates inclined in opposite directions. She is also strengthened forward by similar diagonal plates laid across the beams of the upper deck. Her plank of bottom and decks are of yellow pine. Having a very fine run, she is, of course, weak at her quarters, in consequence of which, Mr. Steers has fitted on each side a large 2-inch iron stay or brace, which lies along the upper deck beams, and passing through the decks below steps upon the stern post. This is certainly a curious arrangement for a ship of war. It may as well be added here, that when she is docked, it is thought necessary by Mr. Steers to brace her two sides together, at about the turn of the bilge, by means of a chain, which passes over a frame or saddle, which is set up by wedges to tighten the chain.* She is rigged like the *Merrimac* and others.

The *Niagara* carries 12 guns, 5 of a side, and 2 pivot guns, each of them 11 inches in the bore, and weighing upwards of 7 tons. All the guns are mounted on pivoted carriages, and the broadside ports have consequently to be very large—9 feet long and 4 feet high. Through ports of this size the guns would be easily dismounted in close action; but the *Niagara* is intended to be fast, and, being furnished with long-range guns, is supposed to have the power of annoying and injuring an enemy, while she herself keeps out of the range of her enemy's guns. She was, in fact, designed for the express purpose of giving the Americans the advantage over all existing ships; it is satisfactory, however, for us to know

* Notwithstanding these signs of anticipated weakness in the *Niagara*, it has been stated by a person who sighted her both in the stocks and subsequent to her launch, that she "broke" only one inch in her length. This is so extremely improbable that we almost think he must have sighted her *athwartships* instead of *fore and aft!*

that in our own dockyards there are already several new class ships quite competent to match her, and, if we are not mistaken, to give a good account of Mr. Steers' experiment. We should be pleased to know with certainty that such a trial of strength is not likely to come off; we hope it never may.

The engines of the *Niagara*—designed by Mr. Copeland, and built by Pease and Murphy, New York—are similar to those of the *Merrimac*, but she has three cylinders, each 72 in. diameter and 3 feet stroke, instead of two. Each frame for cylinders is cast in one piece; the cylinders have slide valves, and a separate cut-off or expansion slide-valve adjustable so as to cut off at any point from three-eighths to five-eighths of the stroke. Each cylinder has its own separate condenser, air-pump, and hot well; in fact, there are three complete engines, so that, should either become deranged, the others would be still available. The screw propeller (formed of composition) is 18 feet 3 inches diameter and 4 feet 2 inches long, with pitch of 29½ feet (at the periphery.) The boilers are four in number, 11½ feet long, 21 feet wide, and 15 feet high. Like those of the frigate, they are Mr. Martin's vertical tubular. They are set in pairs, the flues discharging into two chimneys.

In concluding these remarks we would refer our readers back to page 125 of our number for Aug. 9th (No. 1722), in which we published a very excellent (though not faultless) criticism upon the *Niagara*, extracted from the *Journal* of the Franklin Institute.

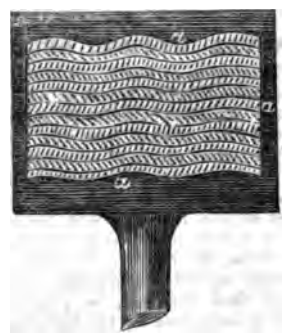
IMPROVEMENTS IN THE VENTILATION AND FURNACE-DRAUGHT OF STEAM VESSELS.

Mr. Charles Wye Williams, of Liverpool, proposes in the specification of a patent just completed, to employ the ordinary rotatory fans, or other description of blowing or exhausting apparatus, worked by a small independent engine, or by being connected with the marine engine, for the purpose of obtaining an improved draught of air. The details of the invention are as follows:—He proposes to ventilate the cabins, hold, and other places, by the exhaustion or propulsion of air in pipes or other air passages circulating through different parts of vessels, providing such suitable outlets or inlets, perforations, valves, or similar contrivances, as may be required. He also employs the same mechanical arrangements to exhaust the products of combustion from the engine boiler furnaces by the funnels, and thereby promote the combustion of the fuel; or he sometimes causes the air to be forced into the engine and stoke rooms, by which means the furnaces will be better supplied with air. It is obvious that the same fan or air pump, while exhausting one set of air pipes or passages, may at the same time be propelling air in another set of like pipes or passages, when so desired.

FOX'S SPRINGS FOR RAILWAY AND OTHER CARRIAGES.

Mr. Samuel Fox, of Stock's Bridge, York, has patented the method of applying corrugated steel plates in constructing springs for railway and other carriages, in place of the flat or tapering plates of steel now used, by which lighter springs may be constructed for supporting a given weight.

The annexed engraving is a transverse section, of a carriage spring so constructed. *a*, *a*, are the plates of steel, which are super



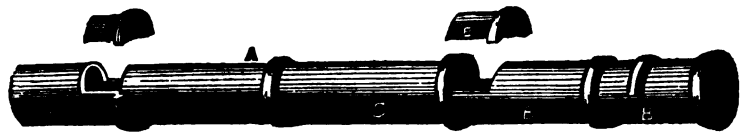
posed one on the other, as in ordinary carriage springs; but in place of being made flat or tapering, as in ordinary springs, they are corrugated, as is shown, in order to give them greater strength.

KERSEY'S PATENT DRAIN PIPES

In constructing earthenware pipes, in order to give additional facility for correctly laying such pipes, and for opening them in case of stoppage, Mr. Kersey, of St. George's-road, Southwark, proposes the following arrangement. He makes an ordinary whole socket pipe, and while it is in a green state, divides the socket and part of the plain pipe, or it may be the plain end of the pipe, longitudinally, by a cutting wire, or otherwise, for any required length; and then by a transverse cut, commencing at the end of the longitudinal one, separates a portion which, when the drain is laid, serves as a lid or cover which can be removed when desired; or pieces of similar

forms to those obtained by thus dividing a socket pipe may be otherwise moulded or formed. Pipes thus constructed he lays at intervals in a drain of ordinary socket pipes, so that by removing the lids, above described, the state of the drain may be ascertained, or a damaged pipe may be removed.

The annexed engraving shows a longitudinal perspective view of several pipes constructed according to the invention. The pipes, A, are each formed by dividing the socket and part of the plain pipe longitudinally and transversely before burning the same; the pipes, B, have their plain ends divided longitudinally and transversely before burning the same, and a portion of socket is made on the moveable part, B, in order, when the parts, B B, of a pipe are put together, the moveable part may be rendered more secure. C is an ordinary drain pipe, any number of which may be laid in succession, and then one or more of



the pipes, A or B. Hence, whenever a pipe, A or B, is laid, by simply raising the ground and lifting off the moveable part of such pipes, A or B, the state of the line of drain may be examined, and, if necessary, the parts may be readily cleaned out without further disturbing the drain.

NOVEL METHOD OF MOUNTING GUNS IN GUN BOATS, &c.

M. Deloigne, of Paris, has brought forward an invention, the object of which is to avoid the injurious effects to ships, gun boats, and rafts, arising from the recoil of heavy mortars or pieces of ordnance fired at a considerable angle of inclination, and the invention consists in forming a well through the boat or raft, in which well the piece of ordnance is to be mounted so that the water shall receive the recoil. In this well a water tight cylinder, somewhat smaller in diameter than the well, is placed. The cylinder is supported in the well, being attached to the boat or raft by vulcanized India rubber or other springs, and is free to move up and down between guides in the well. Its bottom is formed by the breach plate of the gun or mortar, which is made as is well understood. The bottom of the cylinder is by preference made to be below the line of floatation, so as to be constantly surrounded by water inside the well. Or instead of causing the breach to act direct, and making a well in the boat, a strong rod running through the boat supporting the gun at its upper end, and having a suitable plate at its lower end in the water, with suitable spring to keep the upper end tightly against the breach of the mortar, may be made to serve as intermediate between the gun and water; or other analogous means may be used.

MAYNARD'S CHAFF-CUTTING MACHINES.

Mr. R. Maynard, of Whittlesford, Cambridge, has lately patented an invention which relates exclusively to portable and not to fixed chaff engines. By portable chaff engines is meant such as are designed and used for accompanying and being worked by portable steam engines or portable horse powers, and not such as are fixed or worked principally by fixed powers. His improvements consist, first, in using in combination with portable chaff engines an intermediate motion, consisting of a pair of toothed wheels forming part of the chaff engine; through these wheels the power may be transmitted from a set of horse works to the knives and parts connected therewith, and also in using a rigger or drum affixed either to the tail end of the knife wheel spindle, or to a cross spindle forming an angle with the knife wheel spindle, both the pulley and the intermediate motion forming part of the same chaff engine. By this improvement the same chaff engine is suited for being worked by either steam or horse power, and either power may be led to it at convenient parts of the engine. Secondly, in using in combination with portable chaff engines a riddle for separating the chaff from the cavings or short straws. Thirdly, in using in combination with portable chaff engines apparatus for returning imperfectly sifted chaff, so as to subject it to the process of resifting, thereby more effectually separating the imperfectly from the perfectly cut chaff.

IMPROVED BAND SAWS.

MR. W. EXALL, of Reading, Berks, has patented several improvements in the saws known as band or belt saws, that is, a continuous or endless blade working over riggers or cylinders. The improvements in the manufacture of band saws consist, first, in heating by blow pipes or lamps the cast or forged hoop or ring out of which the band saw is to be made during its passage through rollers or dies, for the purpose of reducing it to the proper thinness. Secondly, in giving the blade its proper temper by continued rolling between hard rollers, or by repeated drawing through dies as in drawing wire. Thirdly, tempering the hoop in its entire shape by heating it when in that shape in a suitable oven, and then plunging it into oil or other suitable fluid.

FOREIGN INTELLIGENCE.

RATIONALE OF THE WEATHER AND TEMPERATURE OF THE GLOBE.—It becomes pretty clear every day, that the ice at and in the Polar basin, at the spot whence all tides run N.E. (which in itself is the proof of the existence of such a basin), has received in modern times a greater impetus towards the S.W. In this basin is to be sought that rotating eddy in which was involved the North Pole Expedition of the Frieses, which started in the beginning of the eleventh century, from the mouth of the Weser. If this change was really to take place, it is probable that in a short time not only the western coasts of the north of Russia and of Norway, but also the Atlantic shores of English America and the N.E. shores of the United States, will be much more beset by the ice of the Polar Sea; as even, during the Christian era, the whole northernmost parts of America, with all its coasts and bays, had become packed with ice fields and icebergs, and later only the *littorale* of Greenland, where, when discovered, a much warmer climate existed than is the case now.—What never before has happened took place this summer, when, at the beginning of July, the White Sea was blocked up by gigantic, grey, aged masses of ice, of the size of mountains, which had been carried down from the Polar Sea by the north gales, changing summer into winter, and stopping the commerce of Archangel! The drifting ice masses diffuse their low temperature at great distances and with a remarkable swiftness of expansion. This has been also felt in the Faroe Islands, the temperature of which this year has been quite winterly. Up to the 7th of July the weather has been very cold, from the month of April downwards; and in the valleys even snow had fallen in July, which has never been the case before.—Great uncertainty and a state of shaking *transition* is, therefore, felt also in the meteorology and the *physique* of the whole globe, being placed now, it seems, between comets and icebergs!

ANOTHER NEW COMPOUND OF CAOUTCHOUC.—It has been discovered in the United States, that on India-rubber being mixed with gas-tar, a new compound will result, which will assume any shape or form by the lathe or other cutting instruments. It is of a black jet colour, and can be polished to the brightest hue. It is thought, that this new material, which we propose to name after the yet *unknown* (!) *inventor* of the dissolution of caoutchouc in naphtha, and from whom Messrs. Macintosh purchased the secret for 10*l.*—it is thought, that this new material will take up the place of several other materials now used in the making of furniture, ornaments, &c. Thus, the great real (not *conventional*) value of India-rubber becomes every day more apparent, and it may not be amiss to fix the attention of *Young India*, or whomever it may now concern, on the great importance of the preservation of the forests where this gum is obtained. We may use coffee instead of tea, and *vice versâ*, but a failing in the supply of either caoutchouc or gutta percha would now make a sore havoc amongst many branches of trade and industry.

GOLD.—M. Le Chevalier, the great French political economist, has calculated that the amount of gold imported into Europe from California and Australia reaches now (in round numbers) the sum of *one hundred and six millions of pounds sterling*. This sum is equivalent to the *whole* amount of coined gold which existed in Western Europe before the year 1849! It requires no great amount of sagacity to conjecture what astounding (and yet unforeseen) changes such an infusion of blood or financial electricity into the body social will produce. We ought, therefore, to be doubly careful about the *soundness* of our enterprise, in such a *crisis*; lest we may, after all, find out that "it is not all gold that glitters."

J. LOTSKY.

15, Gower-street.

ON THE CONSTRUCTION OF ARCHES.

To the Editor of the Mechanics' Magazine.

SIR,—Your correspondent, "F. P.," in allusion to my statement, that "the stones remain in equilibrium," &c., calls it simple, and says there is no position but such for any arch.

Now it is a fallacy to suppose that equi-

librium is necessarily a state of rest; for instance, when a horse exerts a given amount of power upon anything, the force exerted will be in equilibrium with the resistance offered; and when I say that the stones remain in equilibrium, I mean equilibrium in the best sense of the word, namely, stable equilibrium.

Now, in the ordinary arch, it is always more or less unstable according to the shape and other circumstances, as can be easily understood; but in an arch of my construction, incapable, if rightly formed, of moving at all, either up or down, the equilibrium is stable. Indeed, in fact it cannot be called stable, or said to be in equilibrium at all, as it cannot be moved and thus be tested whether it is stable or unstable.

Nothing is more evident than the fact that all arches are in equilibrium of some sort; and to prove how little the shape has to do with the mere "standing" of an arch, I would undertake to build one with stones of any shape, which would stand; but I could not say much for the strength of it in any particular, especially with regard to its resistance of upward thrust.

Of course great care must be taken in the fixing of the springers, as, if the arch were to fall, it would be solely occasioned by the failing of these, and the least error would be increased, as all errors are likely to be.

Arches of equilibrium have been planned, but from the trouble of working the arch-stones to the requisite form, have been abandoned. They have been intended to stand without abutments, but I think that they, as well as ones of my construction, and all others, are safer with, as they offer great resistance to, and more securely keep in their place, the haunches and springers.

I am, Sir, yours, &c.

J. A. D.

Reading, October 4th, 1856.

DR. LARDNER AND THE MOON'S MOTION.

To the Editor of the Mechanics' Magazine.

SIR,—It is a "curious fact" that your correspondents, "A Looker On" and "A Patient Reader," should seem to have taken offence at the announcement of my little discovery about the motion of the hands of a clock, notwithstanding both gentlemen bear testimony to the accuracy of my information. I have also another "curious fact" to communicate, namely, that if we admit the soundness of Dr. Lardner's investigation of the moon's motion (*Mech. Mag.* No. 1721), every time the learned gentleman *takes a walk*, he must in reality be proceeding *towards every point of the compass at once!* No doubt "A Looker On" will take the trouble to explain that "there is nothing extraordinary in this," and your other correspondent, "A Patient Reader," will express astonishment that I should "have found anything curious or unfamiliar in the fact mentioned." To many of your readers, however, who are not "mathematicians and astronomers," it may not be uninteresting to observe that this fact is a logical consequence of Dr. Lardner's application of the resolution and composition of forces, in assuming that a body actually moves rectilineally in two or more different directions at the same time.

I am, Sir, yours, &c.,

S. A. GOOD.

H. M. Dockyard, Pembroke-dock, October 6th, 1856.

P.S.—"A Looker On" must excuse my dulness in failing, after several trials, to verify his great discovery that according to the theory of "Messrs. Symons, Hopkins, and Co.," the earth makes 364 instead of 365 revolutions in the course of a year.

S. A. G.

ADULTERATIONS.

To the Editor of the Mechanics' Magazine.

SIR,—By your taking up the cause of Mr. Cort's family, and of late exposing adulteration, you show, I think, that you *depend* upon and *appeal* to the great bulk of a people of twenty-seven millions; and I opine, moreover, that such a basis is one of trustworthy and unfailing solidity. As far as the adulteration of chemicals (*drogues*) and articles of consumption is concerned, the Prussian Government have cut the matter short by issuing a decree (27th September, 1856), which pronounces capital punishment on any vendor of chemicals or poisons by which human life has been sacrificed. A Draconian law, perhaps; but dragons in human form ought to be thus treated. The punishment for the adulteration of food and drink with any deleterious substance is fixed at fifteen years' hard labour, this being the maximum. Any other adulteration with spurious substitutes is considered as an act of cheating (*Betrug*), and punished accordingly.

Passing over these subjects, Mr. Herbert has, in his late communications on the adulteration of caoutchouc, initiated the uninitiated in quite a new department of chemistry—the *pudenda*, as it were, of science. *Bona corrupta, pessima.* Little did Fourcroy or Humphrey Davy dream of such perversion of the holy dogmas of their science! Still, such it is. But while the unprincipled think how to convert even the arcana of knowledge

into objects of sordid lucre, legislation, as the exponent of a nation's wisdom, ought, on the other hand, to throw her heavy arm into the balance. In the first instance, any sale of an adulterated article implies an "obtaining money under false pretences." In asking, say, for caoutchouc bands, springs, &c., I do not ask for caoutchouc *adulterated* with chalk, red-lead, &c., but I ask for "caoutchouc" in plain English. While the sale of adulterated food acts deleteriously on individuals, the adulteration of *technicals* (if this expression be permitted) may injure, nay, kill hundreds. Such will be the case with cast or wrought-iron beams, rafters, &c. Because, whereas the imperfection of human art and skill will make such articles at times faulty, *even* with the greatest care, this proportion will be still increased when the making of *flawey*, granulated, or crystallized metal will become a matter of scientific research and practice. The Prussian law, however excellent, does not reach into the spheres of present perversion; but a government where a Humboldt has a finger in the pie, may also find remedies for these emergencies.

J. LOTSKY.

15, Gower-street, London.

ACID-PROOF STONE.

To the Editor of the Mechanics' Magazine.

SIR,—I wish to inquire, through the medium of your valuable Journal, the name of, and where could be procured, a stone or stone-ware said to be used for the reception or manufacture of muriatic or hydrochloric acid. The stone is capable of resisting the action of the acid, and is said to be exported to Marseilles. Whether used in the express manufacture of muriatic acid, or whether for the reception of the acid resulting in the course of other processes in the arts, I cannot say.

I am, Sir, yours, &c.,
A. A. O. R.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

PARNELL, M. L. *An improvement in the construction of locks.* Dated Feb. 5, 1856. (No. 310.)

The object of this invention is to frustrate the known method of picking lever locks, and to prevent pressure being obtained with the stump of the bolt against the levers, by the introduction of false instruments or picks, and the levers from being tampered with or raised to their respective gateings, by locking them down into a special chamber cut into each of the levers, and by the back action of the bolt, after the bolt of the lock is locked out with the key, two actions being obtained in the locking and unlocking of the lock by one revolution of the key.

BERGNER, T. *Embossing veneers, so as to represent carvings in wood.* (A communication.) Dated Feb., 5, 1856. (No. 311.)

This invention consists in placing veneers between dies, one of which (the matrix) has its surface formed to the desired pattern, and the other (or plate die) having cavities corresponding to the projections of the matrix. One or both dies are moderately heated, and the veneers between them submitted to a considerable pressure. The hollows on the back of the veneer are afterwards filled up with any plastic substance.

JENNINGS, F. M. *Improvements in bleaching vegetable fibres.* Dated Feb. 5, 1856. (No. 312.)

These improvements consist in bleaching vegetable fibres by the use of a solution of hypochlorite of soda, in combination with an excess of caustic, carbonate or bi-carbonate of soda, or any mixture of those salts, or caustic carbonate or bicarbonate of potash, or any mixtures of those salts of potash and soda.

HOWARD, J. *Improved apparatus for making moulds for castings.* Dated Feb. 5, 1856. (No. 313.)

Claims.—1. The use of a sliding rod or mandril, or its equivalent, for carrying up the pattern through the moulding plate into the mould box or flask, and withdrawing it therefrom when the operation of moulding has been effected. 2. The use of moulding plates, constructed as described, for sustaining the moulded sand, and allowing of the withdrawal through them of patterns of which the wheel and plough frame are the type. 3. A general arrangement of apparatus described.

MCDOUGALL, A. *Improvements in treating bones, other animal matters, and other substances containing phosphates for the purpose of obtaining manure and other products.* Dated Feb. 5, 1856. (No. 314.)

This invention consists—1. In operating upon bones by sulphurous acid. 2. In submitting other animal matters to the joint action of sulphurous acid and steam or other heat. 3. In treating other substances, as for instance coprolites, with sulphurous acid, by which operation the patentee obtains manures, gelatinous matters, and fat.

NAPIER, G., and J. MILLER. *Improvements in the mode of driving and in applying screw propellers to the propulsion of vessels.* Dated Feb. 6, 1856. (No. 318.)

This invention is described at page 317 of last Number.

FLETCHER, J. and W. *Improvements in the construction of weighing cranes and other similar elevating machines.* Dated Feb. 6, 1856. (No. 321.)

This invention was described and illustrated at page 265 of No. 1728.

INSHAW, J. *A new or improved pressure gauge.* Dated Feb. 6, 1856. (No. 322.)

This invention consists in causing the convexity produced in two parallel discs by pressure upon them to be registered by a rack and pinion or other arrangement, the motion of which is produced by the joint action of both the said convex discs by a system of levers.

TYERMAN, T. F. *Improvements in apparatus to be applied to omnibuses and other carriages for receiving wet umbrellas.* Dated Feb. 6, 1856. (No. 325.)

The patentee forms an enclosed space, the upper portion of which is made into a frame for umbrellas, the lower portion is formed into a trough for the reception of the ends of umbrellas, and for collecting the water flowing from them.

PRESTAGE, F. *Improvements in locomotive engines.* Dated Feb. 6, 1856. (No. 326.)

This invention consists in arranging locomotive engines in the following manner: The boiler, in place of being cylindrical, as usual, is flattened at the top so as to decrease its height, and the tubes are distributed over the whole sectional area of the boiler, and are covered by the water which thus comes up to the top of the boiler, and on the top of the same a hollow longitudinal ridge is formed, which conducts the steam to the steam chest. The working parts of the engine and the driving axle are placed over the boiler, the cylinders being placed in the smoke box above the ends of the boiler tubes, and by thus getting the working tubes over the boiler, the patentee is enabled to place a water tank under the boiler, conformable in shape to the under part of the same. This tank is made to hold all the water necessary for the journey, and the foot board of the engine is extended so as to contain a corresponding amount of coke. Engines thus constructed require no tender.

DUYCK, J. E. *Improvements in the manufacture of oil cake.* Dated Feb. 6, 1856. (No. 327.)

This invention consists in combining burnt, roasted, or torrefied farinaceous and saccharine vegetable matter with oleaginous seeds or substances now ordinarily employed, or capable of being employed, in the manufacture of oil-cake.

FUNCKE, C. F. P. *Improvements in tanning skins and hides.* Dated Feb. 6, 1856. (No. 328.)

This invention was described at page 320 of our last Number.

MEACOCK, J. *An improved means of fixing diaphragms in gas meters.* Dated Feb. 6, 1856. (No. 329.)

This invention consists in fixing such diaphragms in their seats or frames, by interposing their edges between the edge of the frame or seat and a collar, which is secured by means of screws passing through the collar and the edges of the diaphragm and frame. By this means, on a diaphragm having to be renewed, the screws are taken out and the collar removed while the frame is still in its place in the meter.

KENWORTHY, W. *Certain improvements in self-acting mules.* Dated Feb. 7, 1856. (No. 332.)

Claims.—1. In self-acting mules, the use of a circular wheel and guard (instead of the present heart-wheel with its peculiar shaped guard) in combination with two taper drums to produce a differential speed to the putting up motion, and also in combination with a pulley for the drawing out motion. 2. The giving an independent driving motion to the mangle wheel pinion, for putting up the mule carriage, by which the coming-out speed can be altered at pleasure without affecting the rate or speed of putting up, whether the same be accomplished by the changing of the strap from the fast pulley to the loose conical drum as shown herein, or by simply changing the strap to a loose pulley having a wheel upon its boss, to communicate motion to the mangle wheel, or whether the mangle wheel be fitted up with the circular central, or the heart wheel as at present adopted. 3. A cam or tappet with arrangements for effecting the changing of the strap that works the carriage motion, by the return motion of the mangle wheel.

BROOMAN, R. A. *A method of obtaining alcohol from the fruit or pod of the carob-tree.* (A communication.) Dated Feb. 7, 1856. (No. 333.)

This invention consists in obtaining alcohol from the fruit or pod of the carob-tree, by bruising the fruit or pod, mixing it with water, and subjecting the mixture to fermentation and distillation.

RESTELL, T. *Improvements in breech-loading and revolving fire-arms and in cartridges.* Dated Feb. 8, 1856. (No. 337.)

This invention relates mainly to revolving fire-arms which are loaded at the breech, and consists chiefly in an improved trigger, together with the method of action thereof, which by being drawn to and fro, in the line of the barrel, releases the breech, brings the hammer back, brings the chamber containing the charge into position for being fired, brings into play a lever or tongue piece which it holds at the back of and against the breech (the lever or tongue piece forming a support thereto and closing it air tight), and releases the hammer or apparatus which fires the charge.

WALKER, C. *Improvements in safety-valves and in apparatus for cleansing or purifying water in steam boilers.* Dated Feb. 8, 1856. (No. 340.)

Claims.—1. The use of valvular apparatus consisting of duplex balanced valves for the egress of steam, such valves being opened by the action of the steam on a small separate plug or valve which alone is weighted. 2. An arrangement for causing variations of the height of water in the boiler to open the valve by means of a cam pulley actuated by a float, the spindle of the pulley indicating the height of water by an external pointer and dial. 3. The use in boilers of an oscillating vessel perforated over its upper portion, and arranged in connection with a blow-off pipe for removing steam, &c.

SWAN, C., and G. F. *An improved colouring matter for writing, staining, or dyeing, which is also applicable to the production of a copying fluid.* (A communication.) Dated Feb. 9, 1856. (No. 342.)

This invention consists in employing an extract of logwood or hæmatoxylon campechianum.

ELCE, J., and S. F. COTTAM. *An improved mode of lubricating the spindles of machinery used in preparing and spinning cotton and other fibrous materials revolving in a lifting rail.* Dated Feb. 9, 1856. (No. 343.)

This invention consists in attaching to the lifting rail of a roving frame or throstle, or other such machine, in which a lifting rail is employed, a rib covered with flannel or other suitable material, which, being kept saturated with oil or other lubricating material, imparts the same to the spindles as the lifting rail moves up and down.

SCHWARTZKOPFF, L. *Improvements in apparatus for raising mud and soil from the bottoms of rivers and other waters.* Dated Feb. 9, 1856. (No. 350.)

A centrifugal or rotary pump is fixed on board a vessel, with a steam engine for working the same. From the pump descends a suction-pipe arranged so as to admit of its lower end being moved to and fro. The lower end is fitted with an instrument which, on being moved with the pipe, stirs the soil at the bottom of the water, and soil together with some water is continually raised by the pump.

MURATORI, C. *Improvements in the waterproofing of hangings or ornamenting stuffs.* Dated Feb. 11, 1856. (No. 352.)

This invention consists in coating cloths, &c., for making them waterproof, with a composition which prevents dampness penetrating them, and, being of a drying nature, is adapted to the ornamenting of them by printing, painting, &c., so as to render them applicable to the decoration of apartments. The composition is composed as follows:—100 parts in weight of Palermo white, ground or triturated either with white or drying oil purified, and five parts of litharge.

ZAHN, W. H., and J. H. G. WELLS. *Improvements in windmills or wind engines.* Dated Feb. 11, 1856. (No. 353.)

Claims.—The application of vulcanized India-rubber or other springs, in combination with machinery, for the purpose of making windmills or wind engines self-regulating, by allowing the increased velocity of the wind to act upon and lessen the surface of the sails, as well as for altering the surface or angle of the sails at will.

HARFIELD, W. H. *Improvements in the manufacture of metallic screw nuts.* (A communication.) Dated Feb. 11, 1856. (No. 354.)

This invention consists—1. In a method of arranging the die or nut box so that it can be adjusted to the size of the nut which it is to make. 2. In combining with the die or nut box a moveable bottom or punch, having an elastic bearing to enable the machine to adapt itself to the reception of bars of different degrees of thickness, and form perfectly shaped nuts from either a thin or a thick bar, and also to enable it to relieve itself from injurious strains. 3. In so arranging the machine that the metal which is removed from the centre of the nut is forced into the body thereof. 4. In a method of producing the hole in the centre of the nut by the joint action of two round punches.

STEVEN, T. *Improvements in the construction of open and close stoves, which improvements are applicable in part to kitchen ranges and boiler fire-places.* Dated Feb. 11, 1856. (No. 355.)

The patentee describes certain arrangements of parts which cannot be clearly described without illustrations.

BESSEMER, H. *Improvements in the manufacture of malleable or bar iron and steel.* Dated Feb. 12, 1856. (No. 356.)

This invention was described in Mr. Bessemer's paper, published in our Number for Aug. 15. The patentee claims the conversion of molten crude iron, or of remelted pig or finery iron, into steel or into malleable iron, without the use of fuel for reheating or continuing to heat the crude molten metal, such conversion being effected by forcing into and among the particles of a mass of molten iron, currents of air or gaseous matter containing, or capable of evolving, sufficient oxygen to keep up the combustion of the carbon contained in the iron till the conversion is accomplished.

BOUSFIELD, G. T. *An improvement in treating fats and oils.* (A communication.) Dated Feb. 12, 1856. (No. 358.)

Claims.—1. The decomposition of fatty substances into fat, acids, and glycerine, by the action of water at temperatures below 340° Fahr. 2. The making of soap from fatty substances and carbonated alkalies by the action of water at a temperature below 359° Fahr. 3. The application of ordinary high pressure steam boilers for making soap from fatty substances and carbonated alkalies, by the action of water and heat. 4. The use of mechanical agitators inside of the vessels in which fatty substances are decomposed into fat, acids, and glycerine, or in which soap is made from fatty substances and carbonated alkalies, by the action of water, heat, and pressure.

BROOMAN, R. A. *Improvements in the manufacture of cast steel.* (A communication.) Dated Feb. 12, 1856. (No. 359.)

The basis of this invention consists in the introduction into melting pots or crucibles of the usual description for melting blister steel, along with the pieces of wrought or malleable iron, of chemicals in which cyanogen is contained; as, for example, cyanide of potassium, ferro cyanide of potassium, &c., to be used with some form of sal ammoniac.

STEINER, F. *Improvements in machinery to be used in drying fabrics.* Dated Feb. 13, 1856. (No. 361.)

This invention consists in machinery (which requires engravings to illustrate it) for conveying fabrics into the drying stove, imparting motion thereto while in the stove, and withdrawing them from the stove, thereby superseding manual labour and economising fuel.

DAVID, P. T. *Certain improvements in the method of bleaching.* Dated Feb. 13, 1856. (No. 362.)

In this invention the bleaching of cotton is effected by means of chloroform in the state of gas.

MILLS, J. *Certain improvements in the slide valves of steam engines.* Dated Feb. 13, 1856. (No. 363.)

This invention consists in the application of a peculiar form of valve, for cutting off the steam from the cylinder at any given point when used expansively. This valve consists of two plates provided with passages for the steam. The plates are placed face to face, and have corresponding passages formed in each, one of such plates being fixed and the other turning upon it (so as to bring the steam passages opposite or to close them), by means of a spindle passing through the moveable one, and connected with any suitable moving part of the engine.

VIGNAT, L. *A regulator-compensator for the weaving of ribbons and cloths.* Dated Feb. 13, 1856. (No. 364.)

This specification is obscurely drawn, as may be seen from the opening sentence, which is as follows:—"The regulating system for which we ask a patent has the property of precisely unrolling the stuff, so that each clapper effects to the duite or last stroke to the wool."

MOUTRIE, W. F. C. *An improvement in the damper action of pianofortes.* Dated Feb. 13, 1856. (No. 365.)

The dampers are attached to the ends of bars, which move on an axis, carried by a rail suitably placed, and are each constantly pressed towards the strings by a spring. The other end of the lever which carries a damper is stopped by a suitable stop-rail, and by a bent wire constantly presses on the heel or end of the hammer-stick, beyond where it is hinged, there being felt or leather interposed between the heel and the end of the lever.

FOX, S. *Improvements in springs for railway and other carriages.* Dated Feb. 13, 1856. (No. 366.)

This invention consists in applying corrugated steel plates in constructing springs. See page 347 of this Number.

KNIGHT, R. *Improvements in medical chests.* Dated Feb. 13, 1856. (No. 367.)

In each instance there are an external and an internal chest. The external chest contains the internal chest when being carried from place to place, and the external chest forms the stand for the internal one when the same is open and is placed in position for use.

GILCHRIST, W. *Improvements in ornamental weaving.* Dated Feb. 13, 1856. (No. 368.)

This invention relates to an arrangement and construction of the needle frames and bars of lappet looms, to facilitate the introduction of an increased number of frames into a given width or space upon the lathe, or to admit of the use of stronger frames where the number is not increased, this being effected by fitting the frames one within the other, allowing sufficient space in the outer frames for the transverse traverse of the inner ones.

NEWTON, W. E. *Improvements in the manufacture of zinc.* (A communication.) Dated Feb. 13, 1856. (No. 369.)

This invention relates—1. To the obtaining metallic zinc directly from the ore, and consists in causing the metallic vapours, when driven off by heat, to pass through a charge of heated coal or other carbonaceous matter in a chamber, from which air is excluded. 2. To the construction of a furnace for working the improved process, and consists in combining muffles or retorts, in which the ore mixed with coal is to be heated without access of air, with a deoxidising

chamber charged with coal from which air is excluded, when the said chamber communicates with the muffles to receive the metallic vapours, and with a condenser or other vessel in which the vapours, separated from oxygen, condenses to the liquid state. 3. To a method of reducing blue and grey powder to the metallic state, and consists in subjecting such powder to a high degree of heat in a retort which has but one outlet, and that for the escape of the liquid metal, the charge being forced through the retort by a plunger or equivalent means, the object being to prevent the entrance of air.

NEWTON, W. E. *Improvements in the construction of fire-arms.* (A communication.) Dated Feb. 13, 1856. (No. 370.)

To make a repeating musket or a rifle as safe as the repeating pistol, is the object of this invention, which consists—1. In bringing up the chambers separately into a line with the gun-barrel, while all the others remain in a vertical position, each one at the instant of its discharge being so far from the others as to avoid the possibility of communicating combustion from one tube to another. 2. In closing the joint between the barrel and the charge chamber by a sliding ring, made to cover the joint at the instant of the discharge, and moved forward out of the way of the charge chamber when a new chamber is brought into line with the barrel. 3. In a method of preventing the discharge of the piece whenever the joint between the barrel and the charge chamber is not closed by the sliding ring. 4. In a combination of parts whereby the exact movements of the sliding ring are effected at the moment required.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

HELY, A. A. DE K. *Certain improvements applicable in the burning of gas.* Dated Feb. 5, 1856. (No. 315.)

The inventor has a cap or covering of very fine metal, net, or gauze, for instance, that of 625 meshes to the inch, which he applies to the chimneys or envelopes now in use on or over gas-burners, the object being to prevent the escape of noxious vapours.

WILLIAMS, T. *Improvements in omnibuses.* Dated Feb. 5, 1856. (No. 316.)

This invention consists—1. In constructing omnibuses with inside central seats. 2. In an arrangement of outside seats upon the roof facing the driver, divided transversely and longitudinally. 3. In covering or closing in of the top or roof seats by an awning and moveable brackets.

SQUIRE, H. *An improved seal or fastening for envelopes, deeds, or documents.* Dated Feb. 5, 1856. (No. 317.)

This fastening is composed of two principal parts, one formed somewhat like a button, with a pin of soft metal; the other a flat piece of soft metal with a hole through it.

THOMAS, J. *Improvements in the manufacture of soap from the greasy matters obtained from the refuse water, wash, or suds used in woollen or other manufactures or processes.* (A communication.) Dated Feb. 6, 1856. (No. 319.)

The inventor takes the grease and places it in a boiler, adding resin (about 20 parts to 100 of grease), which are melted and mixed together. He then adds an alkali, 2 parts soda and 1 lime, previously mixed and boiled together for two or three hours. When the alkali is added, the whole compound is kept boiling for about four hours, when it may be transferred to frames or moulds.

DODGEON, J., and J. W. BATESON. *Certain improvements in looms for weaving.* Dated Feb. 6, 1856. (No. 320.)

This invention applies—1. To the shuttle-box of the loom, and consists in placing a swell or convex surface upon the inside of the guard of the shuttle-box, instead of upon the back of the shuttle-box, as ordinarily; 2. It applies to the warp or yarn beam, and consists in diminishing the unnecessary drag upon the warp or yarn y passing a strap, band, &c., over the top of the warp beam; one end of the band is secured to the framing, the opposite end to a lever with an adjustable weight: sufficient friction is thus created to retard the rotation of the beam, without unnecessary tension and drag upon the warp.

JOWETT, H. A. *Improvements in railway breaks and carriages, and in signals connected therewith.* Dated Feb. 6, 1856. (No. 323.)

This invention consists in producing nearly an instantaneous stoppage of the wheel by a combination of two agents operated upon by a power obtained by the rotary motion of the wheels. The inventor compresses air in a cylinder, by means of a piston connected to the wheels, and he employs the compressed air to sound a whistle, &c.

SAUTY, C. V. DE. *The prevention of the leading or fouling of fire-arms.* Dated Feb. 6, 1856. (No. 324.)

This invention consists in coating, by means of electricity, balls, bullets, and shot with a coat or cover of copper or of other metal.

BLEASDALE, R. *Certain improvements in the machines for spinning called throstles.* Dated Feb. 7, 1856. (No. 330.)

In ordinary throstles a piece of flannel is introduced between the bottom of the bob-

bin and the copping rail, to produce the requisite drag. This invention consists in using instead of the flannel a metal washer, from which a pin projects, fitting in a hole in the flange of the bobbin. The metal washers bear upon a strip of leather laid on the copping rail. By making the metal washer more or less concave, the drag can be regulated.

BERGNER, T. *A new mode of preparing or facing surfaces of engraved or etched plates of metal or other substance, so that they may be readily printed from by a press without wiping.* (A communication.) Dated Feb. 7, 1856. (No. 331.)

This invention consists in coating or amalgamating with mercury the unengraved parts of the surface of any engraved or etched plate of metal or other substance capable of receiving mercury.

BERLETTE, H. *An improved apparatus for roasting coffee.* Dated Feb. 7, 1856. (No. 334.)

This invention consists in preserving the strength and aroma of the coffee by causing it to be roasted in closed cylindrical chambers or vessels.

WOODMAN, J. *An improved telegraph insulator.* Dated Feb. 8, 1856. (No. 335.)

This invention was described and illustrated at page 277 of our Number for Sept. 20. (No. 1728.)

TROCARD, T. F. *An improved coffee-pot.* Dated Feb. 8, 1856. (No. 336.)

The inventor describes a coffee-pot in which boiling water flows through a rose upon coffee placed in a filter, and is then drawn off through a tap.

JOWETT, H. A. *Improvements in rails used for the construction of the permanent way of railways, and in the means of laying down and fixing them in conjunction with the present rails in use.* Dated Feb. 8, 1856. (No. 338.)

The inventor proposes to dispense with chairs, and partially imbed the rails in the sleepers. He also makes rails each with four wearing surfaces.

ROBERTSON, S., and J. HOWDEN. *Improvements in machinery or apparatus for driving piles.* Dated Feb. 8, 1856. (No. 339.)

This invention relates to various novel arrangements of mechanism or apparatus to be used for effecting the rapid and economical driving of piles.

BOOTH, J. B., and J. BECKETT. *Improvements in machinery for preparing and spinning cotton, wool, and other fibrous materials.* Dated Feb. 8, 1856. (No. 341.)

This invention refers—1. To preparing machines of the character of the roving or slubbing frame, and relates to arrangements *of mechanism,* comprising a lever, clicks, pawls, and ratchet-wheels, for diminishing or increasing the speed of the bobbins as they enlarge in diameter by the material wound upon them. 2. To machines for spinning, which act in the same manner as the self-acting mule, except that the carriage or frame containing the spindle does not move, other arrangements being employed for accomplishing the purpose for which the carriage moves—namely, a bar or rod having a reciprocating movement given to it, which takes with it the thread as delivered by the rollers: and when the length of a stretch is spun, allows it to be wound on to the spindle or cop.

WAILES, G. *Improvements in the construction of valves for regulating the passage of gas and other fluids.* Dated Feb. 9, 1856. (No. 344.)

This invention consists in improvements in the means of transmitting motion to the slide valve. The inventor places a pulley on the axis to which the handle for moving the slide is applied. To this pulley he affixes the end of a chain or strap, the other end of which is carried direct and fixed to the further end of the slide. When the shaft and pulley are turned round, the chain is wound up, and so moves and opens the slide. Another chain is fixed to and wound on this pulley in the opposite direction to the last; thence it passes over a turning pulley and back, to the opposite end of the slide. By turning the key shaft in the opposite direction, this chain will be wound up, and the first unwound, and so move and close the valve. The whole is enclosed within the casing of the valve.

RAWLINGS, J. *Improvements in envelope or stationery cases.* Dated Feb. 9, 1856. (No. 346.)

These improvements refer to cases which have double doors or covers which open to the right and left, and when closed meet in a line down the front, and consist in making these doors of a curved outline in the face.

MARTIN, E. *Improvements in cricket-bats.* Dated Feb. 9, 1856. (No. 347.)

This invention consists in making the handle (which is firmly fitted and glued into the bat) of several pieces of malacca cane longitudinally glued together and turned to suit the hands.

BURTON, T. *An internal boiler-cleaner or mud-stirrer for the effectual cleaning of steam boilers from muddy deposits and all kinds of sediments.* Dated Feb. 9, 1856. (No. 348.)

The inventor fixes at the bottom of steam boilers a stuffing-box through which is passed a sliding rod, on which is fixed a piece of metal of larger diameter than the rod, so that when the latter is moved by a handle outside of the boiler, it forms a

stirrer which stirs up the mud, &c., which is drawn off through a suitable outlet.

CAVE, T. *Improvements in oil lamps, which he calls the "Continual Lamp."* Dated Feb. 9, 1856. (No. 349.)

The inventor describes a lamp in which oil is supplied to the wick by means of a piston drawn gradually down by an India-rubber tube or other spring.

BULLARD, W. A. *An improvement in instruments for fastening doors.* (Partly a communication.) Dated Feb. 9, 1856. (No. 351.)

In this invention a short plate is turned up at right angles, and formed into a point, the other end is attached by an axis to a button. When the plate is introduced between the door and its post, the point enters the post, and the button on being turned prevents the door from being opened.

GIUDICELLI, J. M. *Improvements in the transformation of movement in steam engines and other machinery.* Dated Feb. 12, 1856. (No. 357.)

The object is to obtain from a rectilinear motion a continuous rotary motion. A crank or arm of an ordinary description is keyed on the axis, but the axis is not divided, and in connection with such arm or crank a frame is used, having through it two slots at right angles to each other, and each slot is of the length of the double throw of the crank or arm. To this frame the to-and-fro motion is communicated; the axis passes constantly in one of the slots, whilst the crank-pin passes backwards and forwards in the other.

JABLONOWSKI, F. P. *A new process of chromo-lithographic painting on glass, porcelain, clays, lava, and other materials susceptible of vitrifaction, and on all metals and metallic compounds capable of receiving an enamelled surface.* Dated Feb. 12, 1856. (No. 360.)

This invention relates to a new process, by the aid of which printing in black and chromo-litho can be effected upon glass, porcelain, lava, delf-ware, and all burnt clays or potters' earths. The process cannot be described, because certain of the matters employed were not mentioned in the specification.

PROVISIONAL PROTECTIONS.

Dated July 18, 1856.

1690. William Leuchars, of Piccadilly, Middlesex. Improvements in locks for travelling bags.

Dated August 26, 1856.

1993. Samuel Jay and George Smith, both of Regent-street, Middlesex. An improved facing or covering to be attached to the outside of ladies' dresses, mantles, or other articles of attire, peculiarly adapted for the warmth and protection of the chest.

Dated September 4, 1856.

2049. James Picken, of Dunlop, Ayr, N.B., millwright. Improvements in the arrangement of the feed apparatus of machines for thrashing or separating grain.

Dated September 13, 1856.

2144. Richard Peyton, of Birmingham, Warwick, manufacturer. An improvement or improvements in the manufacture of metallic bedsteads and other articles for sitting, lying, and reclining upon.

2146. James Stuart Vaughan, of Stockland Vicarage, near Bridgwater, Somerset. An improvement or improvements in the apparatus for making infusions of vegetable or other substances.

2148. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in mills. A communication.

2150. Samuel Cunliffe Lister, of Manningham, near Bradford, York. Improvements in preparing and spinning cotton, flax, and similar fibres.

Dated September 15, 1856.

2154. Jean Baptiste Justin Lassie, of Rue de l'Echiquier, Paris, mechanical engineer. A new system of aërial navigation.

2156. Calvin Kline, of Brooklyn, New York, U.S. The improvement of mariners' and other compasses, by which the effect of local attraction is cut off or neutralised, and the compass is made to traverse more perfectly.

2158. Alexander Rowand, of Glasgow, Lanark, N.B., merchant. Improvements in cases or vessels for holding gunpowder.

Dated September 16, 1856.

2160. Robert Elmy Garrood, of Chelmsford, Essex, plumber and glazier. Improvements in stop cocks and valves for the drawing off and passage of air, gas, steam, water, and other fluids, or for any other purpose for which the same may be applicable.

2162. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improved apparatus for raising water by atmospheric pressure. A communication from Messrs. D. Peré and Co., of Passy, France.

2164. Robert Lavender, of Aldersgate-street, London, and Edward Lavender, of Aston-street, Limehouse, Middlesex. Improvements in raising water and other fluids, and in obtaining power thereby.

2166. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in water closets and night stools. A communication from P. Saroglia and V. Belli.

2168. Robert Mushet, of Coleford, Gloucester, metallurgist. Improvements in the manufacture of iron.

2170. Robert Mushet, of Coleford, Gloucester. metallurgist. Improvements in the manufacture of iron.

Dated September 17, 1856.

2172. Robert Burns, of Liverpool, Lancaster, engineer. Improvements in bone mills.

2174. David Crichton, of Manchester, Lancaster, machinist, and James Cathcart, of the same place, mechanician. Improvements in looms for weaving.

2176. Antoine Andraud, of Paris, France, engineer. Certain improvements in wheelbarrows.

2180. George Davies, of Serle-street, Lincoln's-inn, Middlesex, civil engineer. Improvements in apparatus for actuating railway breaks. A communication from J. Héberlein, of Munich, Bavaria.

2182. John Muir Hetherington, of Manchester, Lancaster, machinist, and James Gee, of the same place, draughtsman. Improvements in flyers for preparing cotton and other fibrous substances for spinning.

Dated September 18, 1856.

2183. Isham Baggs, of Manchester-street, Argyle-square, Middlesex, civil engineer. Improvements in smelting or reducing copper and other metals from their ores, and in the manufacture of sulphuric acid in or by such processes.

2184. Thomas Callender Hinde, of Birmingham, Warwick, merchant and manufacturer. An improvement or improvements in the manufacture of iron.

2185. Theophilus Horrex, of South-square, Gray's-inn, Middlesex, gentleman. Improvements in means or apparatus to facilitate the delivery of coals to cellars and other such places.

2186. Louis Jacquemier, of Charlotte-street, Fitzroy-square, Middlesex, gentleman. An improved method of hardening and colouring alabaster and other gypsums, and calcareous stones and earths. A communication from the Marquis Campana.

2187. George Hill, of City-road, Derby, engineer. Improvements in feeding steam boilers.

2188. André Gabriel Guillaumin, of Paris, France, merchant. An improved ramrod.

2189. Richard Wilson, of Oxford-court, Salters'-hall, London, gentleman. Improvements in the construction of fire-proof floors and ceilings, applicable in part to the construction of bridges and other structures.

2190. William Frederick Plummer, of St. Mary's Overy Wharf, Southwark, machinist. An improved mode of preparing hard wheat and other hard grain for grinding.

2191. Thomas Greenwood, of Leeds, York, machinist. Improved machinery for trimming the teeth of wheels.

2192. William Henry Cooper, of Manor-cottages, Bromley Hall, Middlesex, fret glazier. An improvement in the manufacture of fretwork for ornamental windows or lights applicable also to the cutting of irregular figures in glass generally.

2193. Charles Goodyear, jun., of Leicester-square, Middlesex. Improvements in the manufacture of penholders and handles for penholders.

Dated September 19, 1856.

2194. Jean Baptiste Honoré de Roussen, of Rue de l'Echiquier, Paris, France. Certain improved apparatus for washing and cleansing ores.

2196. Charles Fréderic Vasserot, of Essex-street, Strand, London. Improvements in filtering water on a large scale. A communication from H. Darcy, of Paris.

2197. James Smale, of Gibraltar-row, Southwark, Surrey, printer. Improvements in the mode, means, or apparatus for printing or transferring designs or letters on to glass.

2198. Pierre Laffitte, of Paris, France, manufacturer. An improved engine with rotary piston, applicable to various purposes.

2201. Arthur Clark, of High-street, Southampton, Hants. Improvements in signal lamps.

2202. William Young, of Queen-street, Cheapside, London, lamp manufacturer. Improvements in furnaces, fire-places, and stoves.

2203. Edward Finch, of Bridge Works, Chepstow, engineer. Improvements in the construction of wrought-iron masts, bowsprits, yards, booms, gaffs, and spars, and in rigging ships.

2204. George Dawes, hat manufacturer, of Union-street, Southwark. Improvements in the manufacture of hats.

2205. Richard Van Hees, of Manchester, Lancaster, merchant. Improvements in the construction of electric clocks or time keepers. A communication from R. Kammerer, of Ostend.

Dated September 20, 1856.

2207. John Sherar, of Aberdeen, N.B., ironmonger. Improvements in oil and spirit lamps by the formation of burners obviating shadow.

2208. Richard Van Hees, of Manchester, Lancaster, merchant. Improvements in the construction of wrought iron wheels for railway and other purposes. A communication.

2209. John Naylor, of Birmingham, Warwick, brassfounder. Improvements in window fastenings.

2210. William Johnson, of Lincoln's-inn-fields, Middlesex, civil engineer. Improvements in steam boilers. A communication.

2211. The Hon. William Erskine Cochrane, of Osnaburgh-terrace, Regent's-park, London. An apparatus for converting crude iron, while in a fluid state from a blast or other furnace, into malleable or bar iron and steel.

2212. Joseph Maudslay, of Lambeth, Surrey, engineer. Improvements in fire places for steam boilers.

2213. Thomas Webster Rammel, of Trafalgar-square, Middlesex, civil engineer. Improvements in constructing railways and propelling carriages thereon.

2214. John Roberts, of Walsall, Stafford, mine agent and surveyor, and James Beech, of Walsall, railway inspector. A new or improved railway chair.

2215. Alfred Ford, of Chelsea, Middlesex, gentleman. Improvements in dissolving vulcanized India-rubber for waterproofing and like purposes.

2216. George William Sayer, of Mark-lane, London, gentleman. Improved machinery for stopping or retarding railway carriages. A communication from H. Malepart, of Cognac, France.

2217. Thomas Evans Blackwell, of Clifton, Bristol, engineer. An improved mode of constructing fire flues and air passages.

Dated September 22, 1856.

2218. William Taylor, of Woodhall Cottage, Shipborne, Tunbridge. Improvements in the conversion of cast iron into steel and malleable iron.

2219. Robert Mushet, of Coleford, Gloucester, metallurgist. Improvements in the manufacture of iron and steel.

2220. Robert Mushet, of Coleford, Gloucester, metallurgist. Improvements in the manufacture of iron and steel.

2221. William Bush Sellers and Abraham Sellers, of Sheffield, manufacturers and merchants. An improvement in ever-pointed pencil cases.

2222. Joseph Wilson, of Birmingham, Warwick, gun maker, and Charles Wootton, of Birmingham, cut nail manufacturer. A new or improved screw wrench. A communication.

2223. John Morrison, of Birmingham, Warwick, machinist. A new or improved pen holder.

2224. Thomas Wallace, of Limehouse, Middlesex, engineer. Improvements in the manufacture of wheels, axles, and axle boxes.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

2281. Henry Jenkins, of Birmingham, Warwick, die sinker, stamper, and piercer. Improvements in the manufacture of buckles and other dress fasteners. Dated 29th September, 1856.

NOTICE OF EMENDATION.

1931. *Mechanics' Magazine*, page 262, No. 1727, *for* C. M. Chouillon, *read* C. M. Chouillou.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," October 7th, 1856.)

1274. C. H. Holt. Improvements in steam boilers, furnaces for the same, and apparatus connected therewith.

1277. O. Whittaker and C. Wallwork. Improvements in weaving figured fabrics.

1281. W. C. Hutton. Improvements in stamps or hammers worked by power.

1283. F. L. Stott, T. Belward, and J. Findlow. Improvements in machinery or apparatus for washing wool or garments and other articles made of textile fabrics.

1285. A. Bonvallet. Certain improvements in printing woven fabrics, velvet, skins, and other like materials.

1296. R. Blackwood, sen. Improvements in machinery or apparatus for doubling yarns or threads.

1301. B. J. Heywood. An improved construction of holder for leads and other marking materials.

1303. A. Cadet. Improved stamp inking apparatus. A communication.

1304. A. M. Herland. A new regulator penholder.

1328. W. Potts. Improvements in sepulchral monuments.

1329. R. B. Wigley. A new or improved method of attaching handles to coffins.

1331. D. Morrison. Improvements in the manufacture of metallic bedsteads and other articles to sit or recline on.

1333. D. Morrison. Improvements in the manufacture of articles from malleable cast iron.

1334. J. Christophers. Improvements in knives and forks whose handles are not metallic.

1341. A. E. Brae. Improvements in apparatus for communicating signals from one part of a railway train to another.

1352. T. Chambers, jun. Improvements in agricultural drills.

1364. W. Field and E. Jeffreys. Improvements in machinery for sowing seed and for distributing manure.

1366. J. Holdin. Certain improvements in machinery or apparatus for washing rags, which said improvements are also applicable for washing other materials.

1367. J. Holdin. Certain improvements in machinery or apparatus for bowking, bleaching, dyeing, and washing textile fabrics or materials.

1369. J. Ellis. Improvements in the manufacture of muriate of ammonia and carbonate of ammonia, and in converting certain ingredients employed therein into an artificial manure.

1377. C. Pietroni. Improvements in printing on cloth and other fabrics.

1388. A. V. Newton. Improvements in breech loading fire-arms. A communication.

1406. P. A. L. de Fontainemoreau. Certain improvements in ship building. A communication.

1414. W. Seed. Lap machines or apparatus used in the preparation of cotton and other fibrous substances for spinning.

1442. W. Hunt. Certain improvements in machinery or apparatus for polishing and finishing yarns or threads.

1480. D. Davies. Improvements in wheel tyres.

1487. J. E. Lafond. Improvements in lighting.

1495. R. W. Chandler and T. Oliver. Improvements in engines employed for agricultural purposes.

1507. J. Aikman. Improvements in the treatment, cleansing, or finishing of textile fabrics.

1550. J. H. V. Hengel. Improvements in apparatus for raising and lowering bodies in mines.

1600. G. B. Watkins. Improved apparatus for obtaining infusions or extracts from various substances.

1729. C. Amet. Improved means of distending articles of dress and preserving the form or shape thereof. A communication.

1793. J. Knowles and W. Buxton. Improvements in tuyères.

1923. T. Scott. Improvements in cooking.

1932. J. Leach, W. Turner, and J. Tempest. Improvements in rollers applicable to condensing and all other kinds of engines for carding wool, cotton, and other fibrous materials.

1942. A. C. V. de Doggenfeld. Improved glass ornaments for ornamenting gardens, summer-houses, dinner and other tables, and for other ornamental or decorative purposes.

1972. G. J. Farmer. Improvements in hardening iron and steel.

2030. A. V. Newton. An improved charger for shot-pouches. A communication.

2080. A. V. Newton. Improved machinery for cutting round files. A communication.

2096. A. V. Newton. Improved machinery for cutting India rubber and other substances into threads or narrow strips. A communication.

2115. S. White. An improved method and apparatus for the distillation of certain oils or oily substances from the petroleum, commonly called earth oil, found in certain districts in the Birman Empire, and an improved method of purifying the oils or oily substances so obtained.

2121. J. B. Robinson. Improvements in machinery for effecting agricultural operations. A communication.

2124. P. A. Balestrini. Improvements in protecting and laying telegraphic wires.

2131. C. J. Dumery. Improvements in apparatus for counting, registering, and indicating the distance travelled by vehicles, and the speed and time of travelling.

2158. A. Rowland. Improvements in cases or vessels for holding gunpowder.

2162. A. V. Newton. Improved apparatus for raising water by atmospheric pressure. A communication.

2184. T. C. Hinde. An improvement or improvements in the manufacture of iron.

2202. W. Young. Improvements in furnaces, fire-places, and stoves.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1853.

2248. Samuel Murland.
2251. Robert Halliwell and William Johnson.
2261. Peter Rothwell Jackson.
2285. Manuel Fernandez de Castro.
2287. Henry Goddard.
2289. John Rubery.
2305. Joseph Denton.
2309. William Potts.
2316. George Fergusson Wilson.
2317. George Fergusson Wilson.
2318. George Fergusson Wilson.
2343. Edme Jules Maumené.
2385. Antoine Corvi.
2412. George Collier.

2414. Charles Barraclough.
2420. André Alexander Beaumont.
2497. John Johnson.
2551. Thomas Irving.

LIST OF SEALED PATENTS.

Sealed October 3, 1856.

1856.
814. Robert Halliwell.
816. Samuel Fisher.
846. William Henry Gauntlett.
873. Francesco Nuibo y Pedros.
982. John Yeomanson and William Yeomanson.
1002. William Edward Newton.
1632. Paul Prince.
1756. George Tomlinson Bousfield.
1764. George Tomlinson Bousfield.
1788. William Edward Newton.
1826. William Franklin Shaw.

Sealed October 7, 1856.

848. Stephen Johnson Gold.
852. William Joseph Curtis.
856. Joseph Robert Whitgreave.
861. Henry Laxton.
868. Lewis Normandy.
886. Louis Pierre Coulon.
906. David Blair White.
927. Thomas Hollingworth.
935. Claude Moret.
949. Samuel Mellor and Thomas Young.
957. Alexander Symons and Edward Burgess.
958. Alexander Symons and Edward Burgess.
968. Richard Archibald Brooman.
987. Victor Doat.
995. Isaac Daniel Fraétaniel.
1006. Thomas Heiffor.
1140. Alphonse Meillet.
1656. Alfred Vincent Newton.
1672. Alfred Vincent Newton.
1820. William Wood and Matthew Smith.
1821. William Wood and Matthew Smith.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine*, must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

Presbyter Claudicans writes to thank Mr. Baddeley for the "interesting and satisfactory information supplied so kindly" by him.

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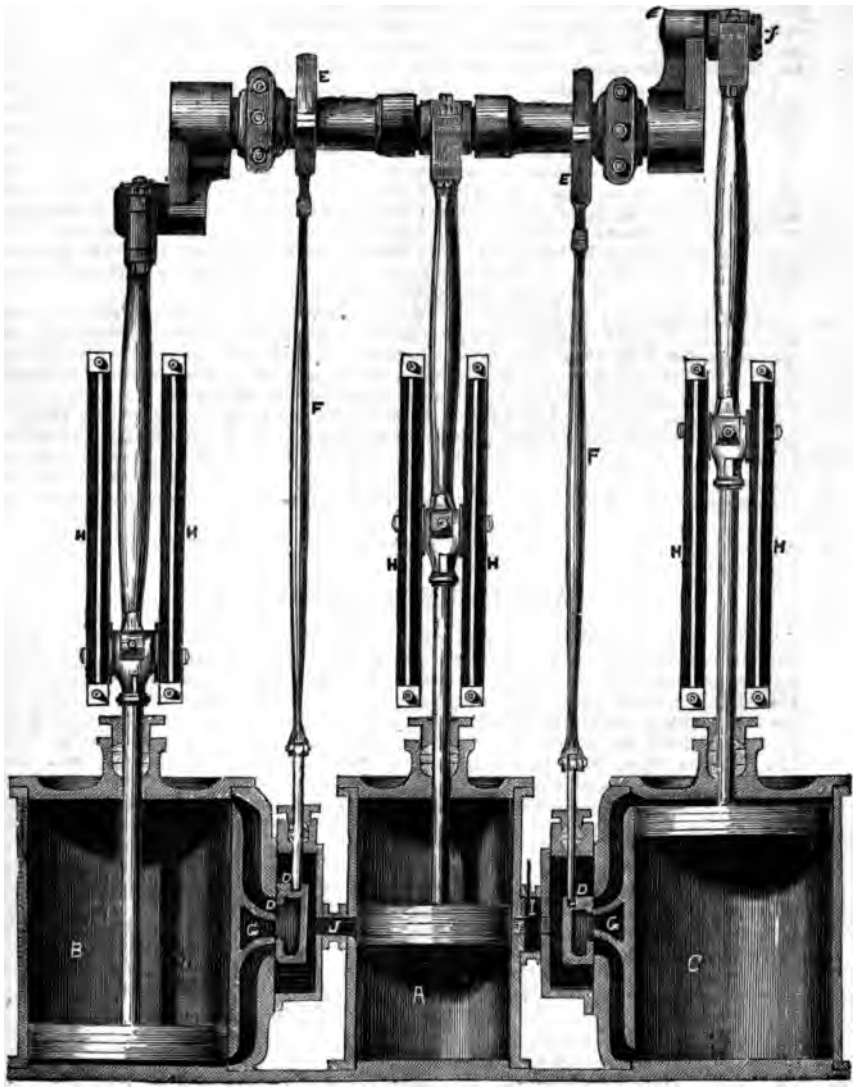
LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, *In the City of London*.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, *Dublin*; *W. C. Campbell* and Co., Hamburg.

Mechanics' Magazine.

No. 1732.] SATURDAY, OCTOBER 18, 1856. [PRICE 3D.

Edited by R. A. Brooman, 166, Fleet-street.

SAMUEL AND NICHOLSON'S CONTINUOUS EXPANSION STEAM-ENGINE.



SAMUEL AND NICHOLSON'S CONTINUOUS EXPANSION STEAM-ENGINE.

A very excellent form of engine, by which the expansive action of steam is rendered available to the greatest extent possible, has just been patented by Mr. J. Samuel, C.E., of Westminster, and Mr. J. Nicholson, of Bow. It is an improvement upon the engines described and illustrated at page 401 of our 53rd vol. The new engine is furnished with three cylinders, into one of which only the steam or other vapour is directly admitted; but after having been partially expanded in that cylinder, it is admitted simultaneously into the two other cylinders, where expansion may be completely carried out. By this arrangement an extremely smooth and uniform action is obtained. The pistons in each cylinder are connected to a shaft with three cranks, of which the central crank is at right angles to the other two, or nearly so. For the purpose of starting, or otherwise, where required, the communication with one of the expansion cylinders is closed.

The engraving on the preceding page is a sectional elevation of an engine constructed according to the invention, showing the manner in which the same may be carried into effect. A is the cylinder supplied directly from the boiler; B and C are expansion cylinders, into which the steam flows from the main cylinder directly the piston therein has passed in its up or down stroke the passages, *a b*. The steam from the main cylinder enters above the piston in one expansion cylinder, and below the piston in the other, the cranks upon the shaft to which the piston rods are connected being set with respect to each other to allow of the pistons occupying the respective positions shown in the drawings. D D are the slides, worked by eccentrics, E E, through the rods, F F; G G are the eduction passages; H H, guides for the heads of the piston rods to work in; I is a slide for shutting off communication with the expansion cylinders, C, when required.

As before stated, for the purpose of starting or otherwise, when required, the communication with one of the expansion cylinders is closed, and steam admitted directly into the cylinder, which is cut off, and the passage between it and the main cylinder is opened after the starting has been effected. Again, where less expansion or more power is required, steam may be admitted directly from the boiler into all three cylinders.

Although the main steam cylinder is shown in the engraving in the centre, which is considered the most advantageous position for it, the patentees do not confine themselves to its being so placed. Instead, also, of applying the improvement to a reciprocating-action marine engine, they sometimes apply it to oscillating cylinders, and to rotary, locomotive, and stationary engines generally, in which, of course, it is equally efficient and economical.

AMERICAN MERCHANT SHIPS.

THE *Great Republic*, the largest ship ever built in our country for the commercial marine, by Donald M'Kay, of Boston, was burned to the water's edge during a great fire in this city in the winter of 1853, when loaded and ready for sea on her first trip. Her hull was saved, however, and sold by auction; she was rigged anew and sent to Europe, where she was employed by the French Government as a store ship during the Crimean war, in which service she surpassed all others for her sailing qualities and great capacity, having carried 3,000 soldiers and 400 horses during the trip, besides heavy cannon and ammunition. Having completed her engagements with the French Government, she arrived at this port last week, and was the object of much attention.

On the 15th ult. a new and magnificent Liverpool packet-ship, the *Ocean Monarch*, was successfully launched from the foot of Tenth-street, East River, in the presence of an assemblage of 5,000 persons. Her length is 240 feet on deck, breadth 46 feet, depth of hold 30 feet. She can carry 7,000 bales of cotton. Her frame is of live and white oak, and she is bound from stem to stern with angle-crossed iron straps 4½ inches by ⅝ inch. She is not only the largest but the strongest merchant ship ever built in New York. A great change has taken place in the form and character of our merchant ships during the past six years. In appearance they are entirely different from the old ships; they are larger, sharper, and more graceful in their proportions.—*Scientific American.*

THE NEW AMERICAN STEAM SHIPS OF WAR.

THE following dimensions of the masts, spars, and sails of the *Merrimac* will be useful to naval architects. On a careful examination of them a few slight discrepancies will be observed, but these are too unimportant to detract much from the value of the information given, which, as it was obtained directly from the ship, may be relied upon as more authentic than any that has hitherto been published upon the subject in this country.

Dimensions of Merrimac's Masts and Spars.

	Length. ft.	in.	Diam. in.	Mast Heads. ft.	in.
Main mast (above deck 86 ft. 9 in.)	110	7	39	19	8
Main topmast	68	0	21	10	10
,, top gallant mast	34	0	12½		
,, royal mast	23	0			
,, pole	4	6			
Fore mast (above deck 78 ft. 9 in.)	111	0	37	18	2
Fore topmast	62	6	21	10	0
,, top gallant mast	31	3	12½		
,, royal mast	21	3			
,, pole	4	3			
Mizen mast (above deck 72 ft. 8 in.)	94	5	28	14	9
Mizen topmast	51	0	15	8	3
,, top gallant mast	25	6	9		
,, royal mast	17	4			
,, pole	3	6			
				Yard Arms.	
Main yard	110	4	25¾	4	6
,, topsail yard	83	4	20½	7	4
,, top gallant yard	52	3	10½	2	9
,, royal yard	35	0	5½	1	9
Fore yard	99	4	23¾	4	2
,, topsail yard	75	0	18¾	6	9
,, top gallant yard	47	0	9¾	2	7
,, royal yard	31	6	5½	1	8
Cross jack yard	81	0	17½	3	6
Mizen topsail yard	61	0	15	5	6
,, top gallant yard	38	2	7½	2	0
,, royal yard	25	6	4½	1	4
Bowsprit out board	36	0	38		
Jib boom	27	0	17	2	0
Flying jib boom	20	3	10½	3	0
Spanker boom	58	0	13	2	0
,, gaff	41	0	8½	5	0

From top of Deck to under side of Trestletrees.	Trestletrees.
Fore ..... 66 ft. 5 in.	..... 22 in.
Main ..... 67 ,, 5 ,,	..... 23 ,,
Mizen ..... 58 ,, 3 ,,	..... 16 ,,

Area of Merrimac's Sails.

	Sq. ft.
Fore sail	4026
Fore top sail	3692
Fore top gallant	1488
Fore royal	693
Fore gaff sail	2193
Fore topmast studding sail (each)	1970
Fore top gallant studding sail (each)	924
Lower studding sail (each)	2193
Main sail	5125
Main top sail	4560
Main top gallant	1815
Main royal	815
Main gaff sail	2166
Main topmast studding sail (each)	2190
Main top gallant studding sail (each)	918
Spanker	3185
Mizen top sail	2436
Mizen top gallant	975
Mizen royal	459
Jib	2425
Flying jib	1780
Total	56,629

Immediately before publishing our last number, we learnt with deep regret that Mr. George Steers, the builder of the *Niagara*, had been thrown from his waggon on Long Island, and thus met with injuries which speedily resulted in his death. It is, therefore, purely from a desire to impart accurate information respecting the new-class American war vessels that we add the following sensible remarks published in the September number of the *Journal of the Franklin Institute*, by the author of the paper referred to at the close of our last week's article.

"In the July number of the *Journal*, I gave my impressions of this war steamer, and regretted that, for her vast size externally, she was so deficient in accommodation and armament within. My remarks were made with the best feeling for all concerned in her construction, and while I acknowledged her beauty of outline, speed, &c., I also mentioned what I considered defects arising from a want of experience in that particular branch of shipbuilding.

"My remarks have attracted the attention of the editors of the *Nautical Magazine*, not from any merit they possess, but from the position they occupy in this *Journal*, a courtesy for which I should thank them, and I will endeavour to make myself more fully understood. The *Niagara* is longer and wider than the other five steamers, and, when complete, will have about the same draught of water. She will then represent 4,750 tons measurement, 12 11-inch guns, and 26 feet draught of water; while each of the others will represent 3,500 tons measurement, 40 guns from 10 down to 8-inch bore, and 23 feet draught of water. In a naval engagement, the armament of the latter ships is every way superior to that of the *Niagara*, while the former would have the advantage in attacking a fortification, as her guns are of larger bore, and have a longer range; but any one who has visited the other steamers will at once have seen that they could easily carry the *Niagara's* armament on their spar-deck, without touching the gun-deck battery of 8-inch guns. The Ordnance Bureau have armed these ships differently, for reasons which I have no doubt are satisfactory.

"To say that it requires a ship of 4,750 tons, drawing 26 feet of water, to carry 12 11-inch guns, is absurd; and the editors of

the *Nautical Journal* have, since the issue of their first number, written pages on this very subject, viz., the importance of having moderate-sized *light draught* vessels carrying heavy guns. And I have no doubt but the senior editor of that journal could, without difficulty, design a vessel of 2,375 tons that shall carry the same armament, and not exceed 18 feet draught of water. They state that Mr. Steers was required to adapt his model to a certain amount of power. This is incorrect. His model and plans were made before the Board of Engineers met at Washington. He informed them that he could spare 100 feet in length of his vessel by the whole width; and they, acting on this information, gave her 50 per cent. more power than the other ships, intending for her bunks to hold 900 tons of coal. Since the ship has been launched, this space of 100 feet has been encroached upon to make room for other stores, and my original statement that she was externally large, and internally small, is true. She might and should have had three, instead of two decks. In my former article I stated that, before a person could properly design a naval vessel, he must first *know* what they required. To this remark the editors of the *Nautical Journal* object; and they assert that private constructors ought, and do know best, what models are most appropriate for naval purposes. I consider it no discredit to the private constructors of the country to say that I do not believe that there is one of them sufficiently acquainted with naval affairs to say how many square feet of deck room, how many cubic feet of capacity, or how many tons of displacement are required for a given armament (the armament regulating the crew, the crew the stores, &c.) The old maxim, that *experience teaches all things*, is as true here as elsewhere, and the editors of the *Nautical Magazine* would themselves find, if they ever make the trial, that they have something to learn even on that subject."

MR. BESSEMER'S DISCOVERY.

BY W. TRURAN, ESQ.

Author of "The Iron Manufacture of Great Britain."

SINCE the publication of my paper on this subject in No. 1727 of the *Mechanics' Magazine*, a remarkable change of opinion has taken place regarding the merit of the process. This has probably arisen from the absence of those specimens of charcoal quality wrought iron and super-excellent steel to which I there alluded as the only evidence of a discovery having been made. Malleable irons described as from pigs, by the new process, *have been* exhibited, but their production was witnessed only by the patentee; and since malleable iron can be produced by other means than those described as having been used—for example, by throwing fine wrought iron scraps into the cupola—some public demonstration of the process from first to last, with the final successful production of malleable iron from ordinary forge pigs, is the only way to remove the unfavourable impression now very current regarding its reality.

Perhaps the most objectionable feature of the short-lived popularity of the reported discovery is seen in the manner in which it has been countenanced and indirectly fostered by a large number of scientific authorities as tending to give continental *savans* a low opinion of our acquaintance with the first principles of metallurgical science. With a host of lecturers and professors of chemistry, installed in comfortable berths and liberally paid, the country could not produce a single individual amongst them to record his opinion of the unsoundness of the theory advanced by the patentee, and industriously circulated in every journal but the *Mechanics' Magazine*. On the contrary, they quietly acquiesced in, and supported a theory, which a moment's examination on the part of a tyro in chemistry, would have sufficed to unmask. The process which was to accomplish such extraordinary results has been liberally supported by writers of a certain kind—those who have just sufficient ability to praise, but have neither the ability nor inclination to inquire into the merits of the process; and I am bound to state that those who have opposed it, have, in nearly every instance, displayed a similar want of information on the subject. I hardly know which of the two appears to the greatest disadvantage: the man who voluntarily praises, or the man who condemns what he does not understand.

In the paper above referred to, I pointed out the difference between the old and new processes of refining as consisting in the omission of the stratum of fuel on the iron, and unhesitatingly affirmed that before *refining* could be effected, the charcoal or coke, on the liquid iron must be restored, for otherwise a wasteful oxidation of the metal would inevitably occur. The correctness of this statement is now universally admitted, and a prominent defect of the iron produced by the new process is observed in every specimen shown to the public, in the shape of "burnt iron," or more properly oxidized iron. By the theorist, the presence of this oxidized iron is treated as a very light matter; in fact, in the description of the new process, it was stated to be dissolved as fast as formed, a fallacy which

I exposed at the time; and since many of your readers may not fully comprehend the principles involved in iron manufacture, I would offer a few remarks thereon. If of no other utility, they may tend to show inventors of new processes in iron manufacture whether their inventions are improvements or the reverse.

Iron ores from which pig iron is produced are composed of iron chemically combined with oxygen as an oxide, and a quantity of earthy matter. To separate the iron, the oxygen is first removed, and a sufficient temperature employed to fuse the metal and earthy matters, when the latter float on the surface, by virtue of their inferior specific gravity. This is the process employed in all highly civilized countries for several centuries past. To the uninitiated it seems a very simple process—it may be performed on the small scale in a common assay furnace; but the production of large quantities of iron economically involves the employment of costly plant, and requires a thorough practical acquaintance with the subject.

The ore is charged along with fuel, and a third material to act as flux to the earthy matter, into the top of a lofty blast furnace; in its descent the superior affinity of carbon over iron at high temperatures for oxygen results in the oxide being decomposed, the metal remaining, and the oxygen ascending with carbon in the gaseous current. Lower down the interior the deoxidised mineral is fused along with the flux, and falls below the oxidizing influence of the blast, protected by a floating stratum of liquid cinder. This stratum of cinder is absolutely necessary, and when the ore, as in the case of rich hematites, does not produce it, the deficiency is made good by adding clay shale or other similar material to form, along with lime, a fusible compound. It will thus be seen that the carbon of the fuel performs a double office—liberates the iron from the condition of an oxide, and by combustion generates the heat for liberating the iron from the earthy matrix of the ore—while the earthy matters themselves are indispensable to its subsequent protection while in the furnace. The iron thus obtained is not free from impurities; it contains carbon, silicon, aluminum, manganese, magnesium, calcium, sulphur, phosphorus, and occasionally other substances.

The affinity of iron for oxygen at high temperature is very great, and unprotected by a covering of liquid cinder, or carbon, would quietly return to the state from which the ironmaster has just rescued it—an oxide. Allowed to flow from the blast into the hearth of the refining furnace, it is subjected to numerous currents of blast to refine it. But in the refinery furnace its affinity for oxygen is nowise diminished, and while the manufacturer forces air into the mass to consume the carbon and slowly oxidize the alloys, so that they may separate in a great measure in the cinder of the process, he is obliged to keep a reserve of carbon over the metal for the instant decomposition of the portion oxidized by the blast. With every precaution, however, a quantity returns to the state of an oxide, and is subsequently obtained separate from the refined metal. In the subsequent processes of puddling and heating great care is taken that oxygen free to combine with the iron do not enter the furnace in considerable quantity; thus preventing, as much as possible, the return of the metal to the state of an oxide. The oxidized metal of the several processes is collected, and again charged into the high blast furnace, as the only economical method of effecting its reconversion to the metallic state. Having to again incur the cost of manufacturing such portions, the ironmaster is naturally anxious to reduce the quantity thus treated to the lowest practicable point.

The new process is based on assumptions; first, that crude pig iron contains 5 per cent. of carbon, whereas a moiety of the iron employed in making bars contains less than 2½ per cent. This discrepancy, however, is not of moment at this stage, and we pass on to the second; that the forcing of air into liquid cast iron, unprotected by superincumbent carbon, annihilates the metals and phosphorus in alloy, and converts the sulphur into sulphurous acid gas, all in thirty minutes; and, thirdly, that the atmospheric air which is to do all this will have no oxidising influence on the liquid iron.

How or by what means the natural affinity of oxygen for iron at high temperature was destroyed, we are not informed; but looking at the quantity of oxidized iron in the ingots produced, we may reasonably doubt whether, during either of the experiments, there was a diminution of that affinity for a single moment. Instead of annihilating the metallic alloys, they are found to exist in the ingots to the same extent as in the original crude iron; and it is questionable if one single atom of phosphorus or sulphur was separated, for the results of analysis are altogether against a more favourable conclusion. Phosphorus and sulphur exist to the extent of 1½ per cent. in many pig irons, and their removal is essentially necessary to the production of good malleable iron.

Since the production of *malleable iron and steel* in thirty minutes by merely directing five or six small blast jets through molten crude iron has failed, a writer who con-

sidered his forte to be in praising rather than examining the merits of the new process, now advances the untenable doctrine that liquid cast iron may be "refined" in three minutes merely by directing 700 or 800 small currents of blast through it as it flows from the blast furnace. The assumption, at one time so industriously circulated, that forcing air through liquid cast iron produced malleable iron or steel at pleasure is thrown aside, and the product is described simply as *refined* metal. Now the term "refined metal" is applicable only to crude iron which has been deprived, to a very large extent, of the matters in alloy. The crude iron refined in three minutes by this process, is freed from a portion of its carbon, but of no other substance, while this trifling step towards purity is obtained at the expense of oxidizing an unnecessarily large quantity of iron. To term the product of this process "refined" metal is about as correct as to call it "cast steel."

Dry high pressure steam as an oxidizing agent penetrating the liquid iron formed the subject of a patent to Guest and Evans, September 28th, 1840 (see number 896); previously, a Mr. Leighton had unsuccessfully attempted puddling in an atmosphere of steam; but it is scarcely necessary to state that while a useful agent in oxidizing the alloys, for the reasons already given, it is impossible to limit its action to these alone, and consequently the loss of metal is very great.

On perusing some of the letters written in praise of the new process, we are struck with the little attention paid to the correctness of the statements adduced. A civil engineer, who has written much on lunar influence, gravely states that nailers blow on the iron while on the anvil, in order to keep it hot. We need hardly say that no practical worker of iron ever thinks of directing the blast of his bellows on the iron, whether in or out of the fire, well knowing that the burning (oxidizing iron) would prevent alike the working and welding of the pieces under treatment. The idea of obtaining economically a high temperature by the combustion of a portion of the iron, is too absurd for comment.

I would remark, in conclusion, that individuals seeking to effect improvements on the present mode of converting cast into wrought iron (and there is room for much improvement) should bear in mind that the reduction of the oxide to metallic iron is a costly process, and every atom of oxide, produced in subsequent processes, is simply undoing, to that extent, what the iron-master effected at such great cost.

Marazion, Oct. 6, 1856.

MARTIEN'S IMPROVEMENTS IN THE MANUFACTURE OF IRON.

Mr. Joseph Gilbert Martien, whose inventions have been so frequently spoken of in connection with Mr. Bessemer's iron-making process, has just filed the specification of a further patent for improvements in the manufacture of iron. This new invention is described by him as follows. It "consists in using or applying certain materials to the liquid iron thus subjected" (that is according to his former patent) "to the action of air or steam for the purpose of purifying or assisting in the purifying of the iron; and I use or apply those materials to the iron in the liquid state in which it comes from the furnace in such manner that they shall become blended with or disseminated through the metal so as to act upon every part of it as far as practically may be.

"When the iron to be purified contains sulphur, I use chlorine for the purpose of purifying the iron from the sulphur, and the chlorine being in a gaseous state I blow it into the iron in the same manner as described in the said specification of my said former letters patent, and either alone or mixed with air through separate tuyeres, or through the same tuyeres as the air employed in the purifying process. The quantity of chlorine to be used must depend upon the quantity of sulphur in the iron, and I use such a quantity of the chlorine as will combine with and carry off all the sulphur.

"When the iron to be purified contains sulphur and also some oxide of iron, I use hydrogen or carburetted hydrogen (coal gas) in order to reduce the oxide to a metallic state and to combine with and carry off the sulphur, and I apply such gas in the same way as chlorine, but if the gas be mixed with air, great care must be taken not to mix the air and gas in such proportions as to form an explosive compound.

"When iron contains, either at the commencement or at any other part of the process, oxide of iron as well as sulphur, it may be convenient first to use chlorine for the purpose of carrying off the sulphur and afterwards to use hydrogen or carburetted hydrogen for the purpose of reducing the oxyde to a metallic state.

"In order to assist in purifying the iron from silicate, and make it work more kindly, I add to the iron as it flows from the blast furnace, or immediately after, about 3 per cent. of oxide of manganese either alone or mixed with either of the materials hereinafter mentioned. I prefer to blow this oxide into the fluid metal by means of air in the same way as the air used for purify-

ing the metal is blown into; or the powdered oxide may be blown in through the same tuyere as, or together with, that air. Oxide of zinc may also be used in the same manner in order to assist in decarbonizing the liquid metal.

"There is a well-known natural mineral or metallic substance, called spathose ore, containing, as I believe, carbonates of the oxides of iron and manganese and some other elements. In order to decarbonize or assist in decarbonizing the liquid iron to be purified, I add to it about 5 per cent. of the spathose ore, and I prefer to add it in a powdered state, and to blow it through tuyeres into the liquid iron in the same way as the oxide of manganese. And in order to make the iron work more kindly I use together with the oxide of manganese or spathose ore, or mixed with them or either of them, about 2 per cent. of clay which is free from silica, and I dry and powder that clay and add it to the iron in the same way as the oxide of manganese and spathose ore.

"When chlorine is not used in purifying the iron, chloride of sodium may also be used mixed or together with any of the materials abovementioned, but I do not claim the use of chloride of sodium as any part of my invention.

"Instead of blowing the solid matters abovementioned into the liquid metal they may be added to it in any other way, taking care to stir up the metal or use other sufficient means to cause them to be thoroughly mixed."

The above is a copy of Mr. Martien's specification, a short and formal claim only being omitted.

ENTERTAINMENT TO PROFESSOR MORSE.

On Thursday, Oct. 9, a public dinner was given at the Albion Tavern to Professor Morse, of the United States, in acknowledgment of his services in the development of the electric telegraph, and with a view of expressing the opinion of the importance of a submarine communication with America. The chair was taken by Mr. W. Fothergill Cooke, one of the directors of the Electric Company, who was supported by Lord Charles Clinton, Sirs James Carmichael and Charles Fox, General Wylde, Dr. O'Shaughnessy, Messrs. Rowland Hill, Cyrus Field, J. W. Brett, C. T. Bright, E. B. Bright, T. Crampton and others.

In proposing the health of Professor Morse, the chairman spoke very highly of the system introduced by the Professor. The healths of Mr. Brett, Mr. Crampton, Sir Charles Fox, and several other eminent persons were drunk, and suitably responded to, as well as one to the Telegraph Companies of England.

THE ATLANTIC SUBMARINE TELEGRAPH.

Great efforts are now being made to realize the long-cherished desire of putting England and America into telegraphic communication with each other. The following highly encouraging letter has been published by Professor Morse:—

My Dear Sir,—As the electrician of the New York, Newfoundland, and London Telegraph Company, it is with the highest gratification that I have to apprise you of the result of our experiments of this morning upon a single continuous conductor of more than 2,000 miles in extent, a distance you will perceive sufficient to cross the Atlantic Ocean, from Newfoundland to Ireland.

The admirable arrangements made at the Magnetic Telegraph-office in Old Broad-street, for connecting ten subterranean gutta percha insulated conductors, of over 200 miles each, so as to give one continuous length of more than 2,000 miles during the hours of the night, when the telegraph is not commercially employed, furnished us the means of conclusively settling, by actual experiment, the question of the practicability as well as the practicality of telegraphing through our proposed Atlantic cable.

This result had been thrown into some doubt by the discovery, more than two years since, of certain phenomena upon subterranean and submarine conductors, and had attracted the attention of electricians—particularly of that most eminent philosopher Professor Faraday, and that clear-sighted investigator of electrical phenomena Dr. Whitehouse—and one of these phenomena, to wit, the perceptible retardation of the electric current, threatened to perplex our operations and required careful investigation before we could pronounce with certainty the commercial practicability of the Ocean Telegraph.

I am most happy to inform you that, as a crowning result of a long series of experimental investigation and inductive reasoning upon this subject, the experiments under the direction of Dr. Whitehouse and Mr. Bright, which I witnessed this morning, in which the induction coils and receiving magnets, as modified by these gentlemen, were made to actuate one of my recording instruments, have most satisfactorily resolved all doubts of the practicability as well as practicality of operating the telegraph from Newfoundland to Ireland.

Although we telegraphed signals at the rate of 210·241, and according to the com-

at one time even of 270 per minute upon my telegraphic register (which speed you will perceive is at a rate commercially advantageous), these results were accomplished, notwithstanding many disadvantages in our arrangements, of a temporary and local character—disadvantages which will not occur in the use of our submarine cable.

Having passed the whole night with my active and agreeable collaborators, Dr. Whitehouse and Mr. Bright, without sleep, you will excuse the hurried and brief character of this note, which I could not refrain from sending you, since our experiments this morning settle the scientific and commercial points of our enterprise satisfactorily.

With respect and esteem, your obedient servant, (Signed) SAML. F. B. MORSE.

London, Oct. 3, 5 o'clock, a.m.

To Cyrus W. Field, Esq., Vice-President of the New York, Newfoundland, and London Telegraph Company, 37, Jermyn-street, St. James-street.

The selection of a suitable cable has become of immense importance, for it is upon the nature of that alone that success now depends. For this reason the following paragraph (which we take from the *Mining Journal*) respecting a cable which has been more than once brought before our readers will be read with interest:—

"Arrangements are now being made for the formation of a company to lay down across the Atlantic a line of telegraphic communication upon the principles patented by Mr. Thomas Allan, of Edinburgh. This new rope differs entirely from all other submarine ropes, combining considerably increased conductability with such a diminution in weight, that the entire cable to connect England with America may be conveniently carried in one vessel. Its strength likewise bears a much greater proportion to its weight than is the case with ropes of a common construction, the excessive weight of which makes the carriage of them impracticable, while, besides their deficiency in conducting power for so great a distance, their peculiar construction renders them self-destructive on being submerged to great depths. The cost of construction, and risk in laying down such a line of telegraphic communication would, therefore, be small when compared with the expense and risk under the ordinary systems. Mr. Allan's system thus brings the experiment of electrical communication with America within reasonable compass, as a rope on his principle can be laid down at a cost not exceeding 200,000*l*."

BROWN'S MACHINERY FOR ROLLING RAILWAY SWITCHES.

MESSRS. DAVID AND WILLIAM BROWN, of Smethwick, Stafford, have devised an improved method of rolling railway switches from bars, and rolling tapered ends on other bars requiring the same, such as railway crossings. The invention has been spoken very highly of by those who have seen it in operation.

Fig. 1 Fig. 2.

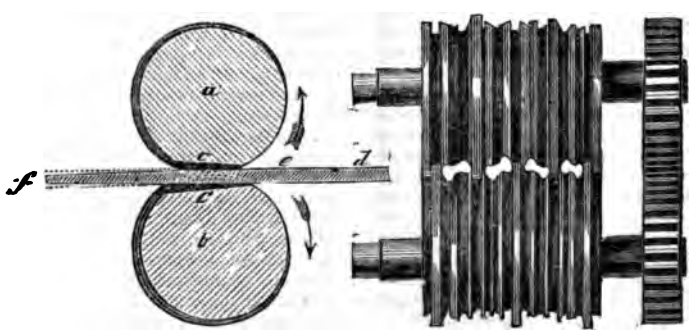
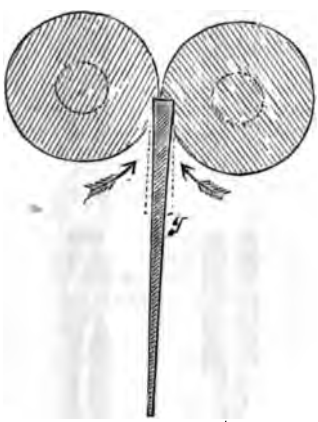


Fig. 1 represents in transverse section, and fig. 2 in side elevation, a pair of the improved rolls for rolling railway switches from bars. The surfaces of the rolls, *a b*, are eccentric to their axes, and pass uniformly from a curve of a minimum to a

curve of a maximum radius. During the revolution of the rolls, in the direction indicated by the arrows, their surfaces gradually approach, and anything rolled between them is consequently tapered. A portion of one or both rolls is cut away, as at *c c*, and the rail, *d*, to be tapered (the end of it being heated) is introduced between the rolls, *a b*, when the parts, *c c*, are opposed to each other. By the revolution of the rolls, *a b*, their curved faces seize the rail, *d*, and give it the taper figure represented; the rail, *d*, is then returned to the workman at the side, *e*, where it was introduced. The figure of the grooves made in the rolls, *a b*, will be readily understood by an inspection of fig. 2. The inventors prefer to throw the rolls, *a b*, out of gear, and bring them to rest in the position represented in fig. 1, before introducing the heated end of the rail or bar between them; and after the rail or bar, *d*, has been introduced, to gear the rolls with the driving mechanism, a stop is placed at *f*, so as to arrest the rail, *d*, at the proper point on its introduction between the rolls. Instead of making both the rolls, *a b*, eccentric, one only of them may be made eccentric, the other having a cylindrical figure. The top roll, *a*, may be raised and lowered by means of screws acting upon the bearings in which it works, as is well understood.

Fig. 3.



In tapering railway bars to make switches, the inventors sometimes subject both ends of the bar to the action of the rolls, thereby tapering it at both ends, and afterwards divide the bar into two pieces, thereby making two switches therefrom. The rail may be subjected to the action of the rolls as many times as is necessary to produce the required taper. The tapering may generally be done at one heat; but, if necessary, the ends may be re-heated during the rolling process. When the machine shown at figs. 1 and 2 is used for shaping the ends of rails for spliced or lapped joints, the requisite change is made in the figure of the rolls. The inventors sometimes employ rolls of the form represented in fig. 3; that is to say, rolls whose surfaces pass uniformly from a curvature of a minimum to a curvature of a maximum radius, the portions of least diameter abutting abruptly against those of greatest diameter, as represented. The bar of iron to be tapered, *g*, is introduced between the rolls when they are in the position represented in the figure. By the revolution of the rolls, the bar of iron, *g*, is tapered, being delivered on the side of the rolls opposite to that at which it was introduced.

In tapering the joined ends of two rails for making a crossing, they proceed in the

Fig. 4.

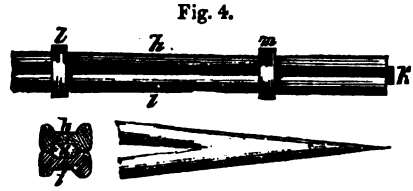


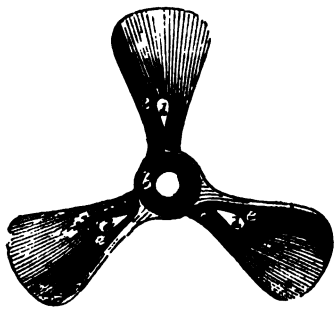
Fig. 5. Fig. 6.

manner illustrated in figs. 4 and 5; that is to say, they place together the two rails, *h i*, whose ends are to be joined and tapered, and introduce between them a piece of steel, *k*, occupying the space between the bodies of the rails, *h i*; they then secure the rails together by bands or clamps, *l m*, and heating the end between which the steel is introduced, subject that end to the action of the rolls, figs. 1 and 2. After the tapering has been effected, they remove the bands or clamps, *l m*, and open out the rails, *h i*, until they make the same angle with one another as the sides of the tapered ends make, as in fig. 6.

SAMUELSON'S SCREW PROPELLERS.

In the use of screw propellers, as ordinarily constructed, it is found that the portion of the blade near the boss has but a small propelling effect, and carries a quantity of water round with the screw, by which power is uselessly expended. In order to partly obviate this inconvenience Mr. M. Samuelson, of Hull, proposes, in the specification of a patent dated 4th March last, to make an open space through the blade close up to the boss in such manner that each propelling blade is connected, by two arms at a distance from each other, to its nave or boss, in place of

mounting each blade of a propeller on a single arm, as has in some cases before been done. The annexed engraving shows one of the improved screws. It will be seen that it has, in this instance, three blades, and that each blade *a* is connected

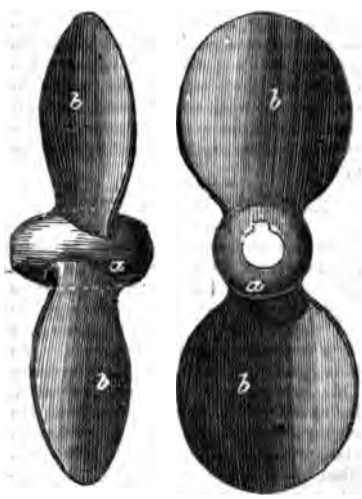


to its boss *b* by two arms *c c*, having an open space *d* between them. He also shows a propeller with two blades, each blade consisting of a frame covered with a plate fixed thereto by rivets.

DIXON'S PATENT SCREW PROPELLER.

Mr. Isaac Dixon, of Liverpool, has patented the following method of constructing screw propellers. He makes the centre or boss on which the blades of the propeller are fixed of an egg-shape, through which the driving-shaft passes longitudinally; and

Fig. 1. Fig. 2.



instead of the propelling blades forming *part of* a screw or spiral, as now generally adopted, he makes them nearly flat on their surfaces, the feather edges having a circular outline, forming about five-sixths of a circle. Fig. 1 is a side elevation of the improved propeller having its centre or boss in line with the driving shaft; fig. 2 is an end elevation of the same, as seen from the stern of the ship; *a* represents the centre or boss, which is made fast to the driving shaft in any desired manner; and *b* the blades, having nearly a circular outline. Two only are shown, but any convenient number may be employed. They may also be placed at any desired angle, according to the amount of the motive power and required speed of the vessel.

SINCLAIR'S WROUGHT-IRON PINS FOR RAILWAY FASTENINGS.

Mr. Archibald Sinclair, of Birmingham, proposes to use wrought-iron pins of cruciform or other analogous section for fastening railway chairs, &c., in order to avoid boring the sleepers, by which they are sometimes split.

Fig. 1. Fig. 2.

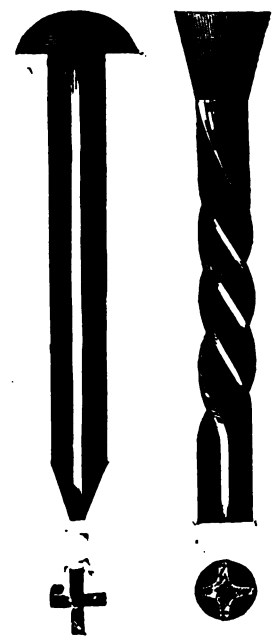


Fig. 1 represents, in elevation and section, a railway pin so constructed. The pin is made from iron rolled or shaped, of the form represented in the section *a*, composed

of four ribs, flutes, or feathers, situated at right angles to one another. The pin may have the ordinary hemispherical or mushroom top, having a cylindrical part underneath, as represented, or the flutes may be carried up to the head. Mr. Sinclair sometimes gives a twisted figure to the flutes, as represented in fig. 2, in which case the pin takes a screw-like motion in being driven. The holes in the railway chairs with which the improved spike is used may be made circular, or of the form of the spike, whether the flutes be straight or twisted. When these holes are made circular, a piece of wood may be inserted therein, and the spike driven through the wood.

The invention, which has been patented, may be modified in various ways. Instead of iron having four flutes, the patentee sometimes employs iron having only two, three, or a greater number of flutes.

WHITE'S SLIPS FOR HAULING-UP SHIPS.

Mr. Thomas White, junior, of Portsmouth, has introduced several improvements in slips and ways for receiving ships requiring repair, and in apparatus for hauling up such slips. His invention relates, firstly, to an improved mode of constructing the longitudinal inclined way up which a ship or vessel requiring repair is drawn out of the water by suitable machinery, so as to place it on dry ground, in order that the bottom of the vessel may be examined with facility, and repaired where required. In ordinary slips the way is provided from end to end with rails which extend down in one uniform incline to such a depth below water as will admit of the cradle or carriage on which the vessel is to be supported (when out of the water) being carried down under the vessel. In carrying the way down in one uniform incline, the excavation required to admit of this is so deep as very greatly to increase the cost of constructing the slip; and in some cases the difficulties experienced in effecting this object would involve so great an expenditure that the undertaking has frequently to be abandoned. Mr. White, however, instead of arranging the rails down to the bottom of the slip at the same incline, proposes to carry them down only to a point a little below the head of the vessel to be operated upon; for instance, supposing the slip is intended for a vessel not exceeding a given tonnage, and having a draught not exceeding, say 12 feet, he carries the inclines down to that point, and then curves the way beyond that point so as to bring the end of the rails to a horizontal, or nearly horizontal position. The carriage or cradle which, from its construction, readily accommodates itself to the level of the rails, may then be lowered down the slip and placed under the floating vessel; and when the vessel is secured in it, hydraulic or other power is applied to draw it up out of the water.

The second improvement relates to the arrangement of the upper part of the slip or way, or that part upon which vessels are intended to be placed while under repair, the object being to increase the capacity of the slip for receiving vessels on their cradles. With this view Mr. White constructs, at any convenient part of the upper way, a lateral way on one or both sides of the longitudinal way, and at right angles thereto; and he connects the two ways together in such a manner that when the carriage with the vessel thereon is brought up to the point of junction on the longitudinal way, it may be moved laterally off that way, so as to admit of other vessels being carried past, if required. The lateral ways may be extended, so as to receive any number of vessels which may, when out of use, be laid up out of the water; or these ways may, in their turn, communicate with ways parallel to the main way, and thus afford increased means for stowing away vessels.

The third part of the invention relates to the apparatus for hauling up ships or vessels, and consists in the employment of a second or runner chain, by which the power of the hauling-up machine, or motive power is to be doubled, without occasioning any additional stress upon such machine.

MR. MECHI ON SEWAGE MANURE.

Sir,—As the disposal of the sewage of our metropolis is a question of considerable national importance, permit me to trouble you with a few remarks.

Common calculation would dictate that the residuum of the food of 2,500,000 inhabitants, and of the animals which they employ, should restore fertility to the lands which it has exhausted. The present proposal is to construct a sewer, at a cost of £2,000,000 to £3,000,000, which will create at one particular outlet a nuisance of intolerable magnitude. My experience in such matters teaches me that for £7 or £8 per acre we may carry out a complete system of subterranean supply; in fact, that for two-thirds of the cost of the proposed sewer tanks, pipes, engines, and every appliance could be provided for an area of 300,000 acres of land.

The effect of such an application would be to render most abundantly fertile large tracts of poor land within a reasonable dis-

tance of the metropolis. To the sands and gravels it might be applied without drainage; the clays would require previous drainage.

The results of such a practice would be felt in an abundance of rich, wholesome milk, and an ample supply of green crops and grass. The operation could only be carried out by a co-operative power similar to that which, by arterial drainage, has changed the great swamps of the Bedford level into a rich corn-growing country. The water alone of London would be a great source of fertility; but, when saturated and enriched with all those good things which have cost our farmers tens of millions to produce, it is easy to comprehend how great is the loss which we at present sustain.

The town of Rugby is an illustration of the practicability of such an operation. There a gentleman in the neighbourhood pays £50 a-year for the sewage from 8,000 inhabitants, and applies it all to the adjoining country with considerable advantage.

The difficulty consists in convincing the general public of the necessity and profit of such an economy.

J. J. Mechi.—*Times.*

Tiptree-hall, Kelvedon, Essex,
Oct. 11, 1856.

REAPING MACHINES.

The following interesting letter on the merits of these machines has been published by Mr. Dray, the well-known agricultural implement manufacturer:—

Sir,—In your report of the Cumberland Agricultural Society, Sir James Graham in his speech states, that although reaping machines "may" be brought to perfection, he considers it will be some time first. Now, Sir, such an uncalled-for remark is calculated to do great injury to the reaping machine makers, Mr. Palmer, Messrs. Burgess and Key, Mr. Crosskill, and myself, as well as to mislead the farmers of England, Ireland, Scotland, and elsewhere, and to prevent them providing themselves with machines for the ensuing year. Perhaps it did not occur to Sir James Graham, that the reaping machine, unlike any other farm implements, can only be employed about three weeks in a year; nor may he be aware, that during that time, for the last six years I have spared neither time, expense, nor trouble thoroughly to test the machine under every variety of circumstance in all parts of the United Kingdom, as well as in France and Belgium; and to such extent have my exertions been carried, that I am now obliged to absent myself from business to recruit my health, which has been very much impaired by the fatigue and anxiety of the last harvest. I give you, therefore, Sir, for the benefit of your readers, as the result of my protracted experience, my unbiassed opinion, that any of the four machines are perfect, and fit for the farmer's use, and that any person with 150 acres of corn to cut, will save the price of the machine by using it; and in this assertion I feel confident of being borne out by the three firms of Messrs. Crosskill, Palmer, and Burgess and Key. Now, as to which is the best of the four machines is quite another matter, and must in a great measure depend on the convenience and fancy of the party using it, some preferring a side and others a back delivery. On the 25th of August, your correspondent gives a favourable account of Crosskill's at the Duke of Bedford's. On the 26th of September, Mr. I. W. Nicholl Currie, of South Wales, quotes Burgess and Key's as the best. Mr. Anthony Hammond, of Westacre, writing to the Royal Agricultural Society, says "At the Lincoln meeting I purchased an improved Hussey, by Dray, with tipping board; this I have used for two harvests entirely to my satisfaction; it has not required 20s. in repairs, and is now ready to go to work at half an hour's notice. The first year I cut about 150 acres of wheat, oats, and rye; the second, 150 acres of wheat, besides oats and rye."

Of Palmer's machine I have seen many good accounts. One gentleman, a Mr. Mears, of Darlington, writes to the *Stockton Times:* "Many agriculturists have seen it cutting wheat, oats, and barley, and consider it perfect." A Mr. Johnson, in the same journal, tenders his thanks to the implement makers for their skill and perseverance in bringing the reaping machine to such a state of perfection as renders it a useful and saving machine to the farmer.

With the above facts before you, I trust, Sir, you will excuse the intrusion my long letter will make on your valuable space, and believe me, Sir, yours, &c.,

William Dray.

Hotel Maurice, Oct. 7, 1856.

LORD PALMERSTON AND THE CORT FAMILY.

Mr. David Mushet writes as follows to the *Mining Journal*, respecting the movement now in progress for raising a fund for the descendants of Henry Cort, the great improver of the iron manufacture:

"I may refer with great respect to the courtesy, accessibility, and kind consideration evinced by Lord Palmerston since this case was first submitted to him, and further shown by his lordship's grant, last week, of a pension to Mr. Richard Cort. It is true

the amount is small, and it can only be considered as a preliminary instalment. But this acknowledgment of the claims is the more gratifying, and the more shows the entire good will of his lordship in duly appreciating the case, because he had previously expressed his fear that it would be utterly impossible, out of the very small yearly sum placed at the disposal of the Government of the British empire for the reward of merit, and the numerous immediate demands on it, to spare any portion for the Cort family. His lordship's deed has, therefore, proved better than his word. It is no small satisfaction to possess a Premier who has reversed the old adage of the unperformed promises of statesmen.

"I think it also a very incumbent duty in this prosperous position of the case, to express the sense of gratitude which all right-minded Britons must feel to the editor of the *Scientific American*, for his cogent remarks upon the Cort miracle, on Dec. 15 last, and in subsequent numbers. A more energetic appeal was never put in print. The voice which was then heard resounding across the Atlantic has proved no small aid in our efforts to awaken the British mind from its deep and strange mesmeric sleep regarding the author of inventions 'now used in manufacturing bar iron in every civilized country under the sun. All nations are his debtors; the benefits conferred on them by his inventions are beyond calculation.' I sincerely trust no Englishman may ever forget to do equal justice to American inventors, especially when visiting the shores of their ancestors, under the sacred claims of hospitality."

BESSEMER AND MARTIEN.

To the Editor of the Mechanics' Magazine.

SIR,—It seems that the course of inventors like that of true love never will run smooth, and nature appears to be as fickle and capricious in science as in any other sphere. A short time since, the world was startled, as by an electric shock, with Mr. Bessemer's discovery in the manufacture of malleable iron and steel. The paper read before the *savans* of the British Association at Cheltenham, created a sensation unparalleled in the history of the iron trade, and Mr. Nasmyth, running about the *conversazione* in ecstacies of delight, was heard to say, "Eh mon! it's enow to make an ironmaster's mouth water to see it." The beautiful simplicity of the invention, its completeness, its intrinsic scientific merits, its control over the ethereal elements, and its entire subjugation of matter to mind won for it the encomiums of men of the highest standing in science and the metallurgical arts; whilst the saving which it was calculated to effect, and which had been practically demonstrated on an extensive scale, gained for it the approbation of the trade; and those who perchance would have felt no appreciation of the solution of a scientific problem in an abstract form could not fail of seeing and appreciating the mercantile worth of the new process. Foremost amongst those who congratulated Mr. Bessemer on his discovery, were men who had been nursed and educated in the iron trade, and who consequently were well qualified to form a correct judgment upon any real improvement therein. It is lamentable, however, to see how readily the impatience and caprice of men will allow them to eat their own words, and to stifle the voice of approbation.

Shortly after the reading of Mr. Bessemer's paper, Mr. David Mushet hastened to bow before the inventor, and to pronounce him the greatest benefactor of mankind. After expatiating on the scientific merits of the discovery, he says, "I do not hesitate to express my conviction that Mr. Bessemer has brought into the world one of the grandest operations ever devised in metallurgy—a truly magnificent process, commanding every requisite of time and circumstance for commercial success;" and then, after alluding to Cort's inventions, he says, "Mr. Bessemer has, I think, invented something equally calculated to stimulate the passions and devices of the base, the mercenary, and the ungrateful." Nor has his prophecy proved to be unfounded, as the subsequent letters and voluminous effusions of this said prophet abundantly testify, and as we shall presently show.

But had Mr. Mushet been in any way deceived by the inventor or his friends when passing the above panegyric? Oh, no! he was perfectly conversant with the invention in all its bearings and details. He could point out exactly wherein its merit consisted—wherein it differed from and infinitely surpassed everything that had before been accomplished; and so full is his overflowing soul, that he even sympathises with the inventor. Yes, the iron critic proves himself to be only a man, and sighs deeply as the net is cast forth. "I regret," says he, "to see Mr. Avery's letter shadowing forth the abyss of a patent dispute. Why should men spread out their brains as a pasture for the ghouls of the law to feed on, whilst the benefited public comes behind and devours their bodies? *But I really do not think Mr. Bessemer is in any danger.* The blowing of air into melted iron in the puddling furnace, in the blast furnace, and elsewhere, is not new. Whatever is the

object of Mr. Martien's application of it, *we cannot suppose he had the remotest conception or forecast of the object for which Mr. Bessemer applies it.*" And then, after congratulating himself that he did not accept the invitation to witness Mr. Martien's process at the Ebbw Vale Works, where everything was "nicely arranged" for him, but in which invention he had "no faith," he says, "With the sense I entertain of the value of Mr. Bessemer's most novel and overwhelming invention, I hold it to be quite impossible that any man, having the slightest glimpse of the real purpose of forcing air into liquid iron, could have occupied a single day in the slow work of the old deoxidising furnace, however varied. Mr. Bessemer's process is so transcendent in its merits, that he ought not to be hindered by any trivial regards whatever. I can feel no delicacy now in discouraging what is entirely annihilated," viz., Mr. Martien's invention. And yet who is the man that has been labouring heart and soul of late to "hinder" Mr. Bessemer? Why, none other than this very man, this David Mushet—the panegyrist of Bessemer, and the self-constituted executioner of Martien; and strange to say, the invention of Bessemer which Mr. Mushet before considered so "transcendent in its merits" is now prostrated before the invention of Martien, in which the genius of Mushet had "no faith," and which he had "no delicacy in discouraging," because of its entire annihilation.

Is it not curious, therefore, to see with what facility men can descend from the zenith of approbation and praise to the nadir of doubt and condemnation. One day Mr. Mushet congratulates himself that he did not accept the invitation to witness Martien's process, because, having "no faith" in it, he would have been compelled to have thrown discredit and discouragement upon it. A few days afterwards, however, "the grandest operations ever devised in metallurgy," the "truly magnificent process, commanding every requisite of time and circumstance for commercial success," sinks into utter insignificance before this great genius. The name of Mushet figures on the patent list as an applicant for "improvements in smelting iron ores." On the same day Mr. Martien applies for a patent for "improvements in the manufacture of iron," and henceforth Mr. Bessemer's discovery is a phantom which men should avoid as they would a ghost. Mr. David Mushet becomes the champion, and strives to vindicate the wrongs of the man whom before he so mercilessly strove strangle. His heart relents; and after ...tiating on the wrongs of Martien and the brilliancy of his discovery, he endeavours to show that the invention will prove a grand affair after all—that by the process in which he had "no faith," and which had been annihilated by Bessemer's discovery, "three-fourths of the operation of puddling might be got rid of, in addition to the production of a costless substitute for the refinery." Moreover, he is now of opinion that "the decarbonizing of the fluid iron with blasts of a low pressure will be attended with less waste, an economy increased by the subdivision of the streams of air." And then with reference to Mr. Bessemer's process—the "truly magnificent process commanding every requisite of time and circumstance for commercial success,"—he says, "A few large tuyeres blowing in air of enormous density for half an hour into a mass of metal, resisting it with equal pressure, must establish as many *foci* of intense oxidation." But further, although admitting that "bars of iron 12 feet long and half inch thick" have been produced from Mr. Bessemer's ingots, and that a "tobacco box" had been made from the same—which tobacco box was as tough as leather—he has the assurance to designate the same "a nondescript product, puzzling all."

Now, can it be possible that Mr. Mushet had been so far bewildered—so far puzzled and blinded by popular acclamation—as not to understand the merits of the discovery on which he had bestowed such praise, which he had so delighted to honour, and for which he soared to the highest realms in quest of fitting terms for his encomiums? If so, it argues little for the value of his published opinions on matters relating to metallurgy. Or has some strong light dawned upon him, revealing the fallacy of his former judgment, and shadowing forth the possibility of eclipsing Mr. Bessemer's discovery by some other "truly magnificent process?" Really it is too bad to keep the world any longer in suspense. In the train of every great discovery a number of minor satellites are invariably to be seen. The elasticity of the English language is stretched to its utmost limits. Words are twisted, and turned, and tortured into every conceivable shape, in order to make them signify something more than they were intended to express. Old claims, real and imaginary, are raked up. Manufacturing princes watch with avidity for loop-holes, through which to jump, in order to evade the inventor's due, and if he be not strong enough to resist the forces thus brought to bear upon him, down he must go into the deep sea of disappointment and remorse, a victim to the avarice and cupidity of the generation for whose benefit nature had cherished him, for whose ad-

vantage he had spent his substance, employed his brains and endured days and months of toil, and sleepless nights without number.

It is not, of course, to be desired that any invention or discovery, however great, should exclude others from travelling in the same course.

"There's room enough for all;"

and, doubtless, all have a just right to express their conscientious opinions upon any public matter; but when we see public men debasing themselves, by becoming public weathercocks, it behoves us to watch their movements and note which way the wind blows. With regard to Mr. Bessemer's discovery, judging from the specimens lately produced and which have been rolled as thin as paper, I think it will require either a very clever or a very lucky man to supersede his discovery or evade his patents.

I am, Sir, yours, &c.,
WILLIAM GREEN.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

NEWTON, A. V. *Improvements in springs applicable to railroad carriages, and to other uses.* (A communication.) Dated Feb. 13, 1856. (No. 371.)

Claim.—Making volute springs (which are coiled with the coils close to sustain each other as the force is applied parallel to the axis) of bars of steel tapering in width from the outer to the inner coil, when the said springs are so coiled that the upper edge of all the coils is on the same plane, and the lower edge in the line of a spiral. And also combining with such a coiled spring a conical frustrum of vulcanized India-rubber or caoutchouc, placed within the conical cavity formed by the spiral line of the lower edge of the coils, that the inner coils may be made sufficiently sensitive to yield to slight forces, and be aided in resisting great forces by the gradually-increasing tensive force of the India-rubber, as it is compressed by the successive coils coming in contact with it.

MITCHELL, H. F. and W., and J. CLARKSON. *Improvements in sewing-machines.* Dated Feb. 13, 1856. (No. 372.)

The patentees work the feed motion direct from the main driving wheel by means of levers and cams, the said motion acting both as a feeder and holder, having a rough surface next to the material. They give the feeder an up and down and backward and forward motion by the same cams. The material to be sewn lying on the top of the machine is pressed down by the feeder, and held fast while the stitch is made: then the feeder rises, passes backward the exact distance for another stitch, and falls upon, draws forward, and holds the material while another stitch is made, and so on continuously.

KELLER, G. L. *A new kind or system of carpet or travelling bag.* Dated Feb. 13, 1856. (No. 374.)

The inventor describes a bag which, by the opening of a lock placed at the top of the frame which connects them, opens in three compartments forming a double trunk, one part in the centre being fitted up as a dressing-case.

CAPP, T. P. *An improved lamp.* Dated Feb. 14, 1856. (No. 376.)

Claim.—A lamp constructed with a fixed piston and moveable oil-chamber, in combination with a system of valves for regulating the action of the oil. The details cannot be described without engravings.

RAMSBOTHAM, H. K., and W. BROWN. *Improvements in combing wool, alpaca, cotton, and other fibrous substances.* Dated Feb. 14, 1856. (No. 378.)

In a former patent, dated the 18th Nov., 1854, the patentees proposed, in preparing and combing wool, &c., to feed such substances on to receiving combs through gill-feeding means, the teeth of which point at right angles (or approximating thereto) to those of the receiving comb. Now they cause the successive quantities of fibre as brought forward by the gills, to be taken by intermediate and independent combs, whose teeth point at right angles (or approximating thereto) to those of the gill combs, and which traverse past such gills in a circle or otherwise.

PARKHURST, S. R. *Improvements in sails and rigging for vessels.* Dated Feb. 14, 1856. (No. 379.)

This invention consists in constructing sails of sectional parts of a circle, and either stretching or furling the same by the motion of a radius bar or yard actuated by competent power.

MCFARLANE, W. *Improvements in building and structural works, and fittings in metal.* Dated Feb. 14, 1856. (No. 380.)

Claims.—1. The mode of connecting the component parts of cast-iron buildings, &c., by means of dovetail grooves or mortises, and dovetail feathers or tenons. 2. The mode of forming joints, levers, pulleys, hinges, latches, fastening, and other moveable details in or upon various cast-iron articles or apparatus, by first casting the moveable details separately, and then placing it in position in a second mould formed for casting the piece to which the detail is to be connected, the working surfaces of the piece

being formed by or cast upon the working surfaces of the moveable detail, the latter being first coated with a suitable preparation to keep the parts free. 3. The mode of constructing cast-iron articles composed of two or more parts required to fit or work upon each other, wherein one of such parts is first cast separately, and is then inserted in a mould to form the surface upon which the corresponding surface of the other part is cast. 4. The mode of making pipes and branches for conveying water and other purposes, by means of green sand cores arranged as described.

TAYLOR, J. *An improvement in constructing and facing walls.* Dated Feb. 14, 1856. (No. 383.)

The facing material is made into slabs, each with a flange or projecting rib at the back (which is not new). A wall is constructed of brickwork, concrete, and the facing-slabs or tiles. In constructing a wall only the brickwork is run up, leaving headers projecting at intervals (on the side to be faced) which support the flanges or ribs of the facing slabs; concrete is poured in to fill up the space between the facing slabs and the brickwork, the concrete resting on the flanges, and aiding in bonding the brickwork with the slabs.

BARTHOLOMEW, W. H. *Improvements in propelling vessels when screws or submerged propellers are used.* Dated Feb. 14, 1856. (No. 384.)

Two high-pressure steam cylinders are fixed on either side of the vessel, and incline at about right angles to each other. The piston-rods work through the lower covers of the steam cylinders, and by means of connecting rods give motion to the crank-shaft of the screw. The boiler is fixed to the vessel between the two steam cylinders, the propeller shaft being below the boiler. The boiler is cylindrical, having a horizontal cylindrical fire-box surrounded by a cylindrical water-space, at the back end of which fire-box tubular flues pass to the smoke-box which is at the other end of the boiler. The section of the boiler is larger through the fire-box than where the tubular flues pass through, and the back and front ends of the boiler are stayed to each other by suitable rods. The cylindrical fire-box is strengthened by belts on its outer surface. Over the fire-box is a steam chest, and below the fire-box is a well to receive sediment. The hand-lever or gearing is placed over the boiler. The valves of the steam cylinder are governed by a link motion. The valves used are piston valves, two to each cylinder. The exhaust is between the two, the steam being admitted on the outer surfaces of them.

MOREWOOD, E., and G. ROGERS. *Improvements in drying and coating iron and copper.* Dated Feb. 14, 1856. (No. 385.)

This invention consists — 1. In drying articles of iron or copper, after they have been placed in a bath to be cleansed or to be coated by deposition of metal, by causing the same to pass between pressing rollers made hollow, so as to admit of being heated by steam or otherwise. 2. In causing them when coating them with varnish or water-repellant matters to be subjected to pressure between rollers. 3. In employing racks, bars, rods, or wire of the coating metal in the coating solution, in order that the iron or copper about to be coated by deposition may rest in or be supported by such racks, rods, wire, or bars.

HEWITSON, W. W. *An improvement in casting the bearings or brasses of machinery.* Dated Feb. 14, 1856. (No. 386.)

The proper mixture of copper, tin, and zinc is run into metal or chill moulds, in place of the moulds heretofore used.

BLACKWELL, T. E. *Improvements in condensing steam, and in cooling and heating fluids.* Dated Feb. 14, 1856. (No. 387.)

This invention consists in combining apparatus with a view to apply the action of a syphon to the tubes or spaces in which the circulating water moves, in order that the water may rise above and descend to its natural level, in passing through the chamber in which is introduced the steam to be condensed, or the fluid to be cooled or heated.

COWPER, C. *Certain improvements in impregnating wood with preservative and colouring materials, and in apparatus for that purpose.* (A communication.) Dated Feb. 14, 1856. (No. 388.)

This invention comprises—1. Completely enclosing the wood in a vessel into which the liquid is introduced, and connecting one end of the piece of wood by means of a plate with the exterior of the vessel, and causing the liquid to be pressed upon with a greater pressure than that to which the aforesaid end of the piece of wood is exposed; by which means the liquid is caused to percolate through the wood, and at the same time to press the end of the piece of wood against the aforesaid plate. 2. Completely enclosing it in a close vessel, and connecting a plate to one end of the piece of wood, as described, and then passing the liquid through the wood in both directions alternately. 3. Certain apparatus for carrying the invention into effect.

GULLIVER, G., and J. GOLDTHORPE. *An improved signal-bell.* Dated Feb. 14, 1856. (No. 389.)

The patentee describes a signal-bell which acts as follows:—Upon one arm of a certain lever being pulled, a cranked lever is

drawn back, together with the tail of the hammer, until the short arm of the lever comes against a stop, when a trigger is depressed, the hammer released, and the bell struck. Upon the first-mentioned lever being released, a weight restores it to its original position, and a spring, pressing against the tail of the cranked lever, forces up the trigger, and engages the tail of the hammer.

DEISS, E. *A method or methods of, and apparatus for extracting oils, fats, greases, and resins from bones, raw wool, seeds, and other substances containing the same, and recovering a certain agent employed in the process.* Dated Feb. 14, 1856. (No. 390.)

This invention consists—1. In the employment of sulphuret of carbon, chloroform, ether, essences, benzine or benzole, for extracting oils, fats, greases, and resins from the substances named in the title. 2. In the recovery or regeneration of the sulphuret of carbon or other agent, whereby it may be used over again. The apparatus employed consists of vessels or digesters, in which the matters to be extracted are placed in contact with the sulphuret of carbon or other agent, and also in distilling-apparatus in communication therewith for the recovery of the extracting agent.

OLDFIELD, E. *Certain improvements in self-acting mules for spinning.* Dated Feb. 15, 1856. (No. 391.)

This invention consists in an improved combination of parts applicable to self-acting mules for guiding the yarn on to the spindle, technically called the copping motion.

TOLHAUSEN, A. *A machine for cutting articles of polygonal figure in wood or other material.* (A communication.) Dated Feb. 15, 1856. (No. 392.)

In this machine the "stuff" is first turned, under the guidance of a pattern, to a form the longitudinal profile of which resembles the intended profile of the figure to be produced, and is afterwards brought to the polygonal form by a longitudinal planing operation effected by rotary cutters, which act upon it under the guidance of the same pattern, without taking it out of the turning centres.

LEACH, E., J. and E., jun. *Improvements in machinery or apparatus for preparing, spinning, and drying yarns, and manufacturing the same into cloth.* Dated Feb. 15, 1856. (No. 393.)

This invention consists—1. In placing a number of ordinary twisted rovings in a suitable creel, and winding them upon a long spool or bobbin bearing upon a surface drum, the rovings passing through guides having a short traverse to wind the threads even, and when using untwisted rovings they are placed upon surface drums or creepers for uncoiling the same. These creepers are connected with the surface drum for winding on, so that the letting off of the one will correspond with the taking up of the other. When spinning two or more threads together, a corresponding number of rovings pass through the same guide. 2. In placing the cops or bobbin of yard upon revolving spindles, and passing the threads over a friction surface (to give tightness to the thread), on a bobbin or spool upon a vertical spindle, which spindle has a differential motion communicated so as to wind at one uniform rate, whatever the size of the bobbin. The patentees also apply a cam or small lever to each of the winding spools, for lifting the bobbin from the friction plate or notch, which takes the bobbin round with the spindle. This is done for facilitating the piecing-up of the threads when broken. 3. In doffing combs where the radial arms to which the combs are attached are in front of the doffing cylinder, as in "Belgian condensers," they place the centre of the radial arm of the comb of the lower doffing comb in front of and below the rubbing belts, and further from the doffing cylinder; thus a greater length of lever is obtained, which causes the doffing comb to follow more closely by the surface of the doffer, stripping the sliver from the carding more efficiently, and enabling them to doff it much nearer and more direct to the belt apron or roller which receives the same, and allowing greater facility for piecing up broken slivers. Also a combination of the radial arms of combs in which their centres or fulcrums are placed in an opposite position to those before described. 4. In steeping the warp or yarn (if wool) in scouring liquor, passing it between pressing rollers, and under rollers in a cistern containing a suitable liquid, then through a series of such pressing rollers and cisterns, until it is cleansed. They then pass it through pressing rollers to make it fit to receive the size, and under rollers in a cistern containing size, then between another pair of pressing rollers to regulate the quantity of size used, and over a cylinder from which it falls into a suitable receiver, or is wound upon a reel. 5. In drying the warp, yarn, or cloth, they wind it upon a reel formed with radiating arms, having grooves to admit of staves being placed between each coil, and by the application of a fan. 6. In making the meshes and dents of the heddles and reeds gradually wider towards their extremities than in the centres, to compensate for the contraction of the weft, caused by the tightness of the thread as drawn from the shuttle, which varies according to the number of shoots

and width of the loom. 7. In the employment of a conical serrated or rasped roller, or a roller with projections on its surface, in connection with a friction wheel acted upon by the movement of the lathe or other motion, for forming a self-acting temple.

HOGG, J., jun. *Improvements in the manufacture of envelopes, and certain other combinations and applications of paper and gum, denominated "letter checks," for containing and securing written, printed, or other communications.* Dated Feb. 15, 1856. (No. 394.)

This invention consists in the application, for the security of papers of any fabric, tint, or combination of tints, or union of paper with any suitable textile fabric, manufactured into the shape of envelopes of any convenient size and pattern, and having one or more of the tongues or flaps or other enclosing portions holed out, perforated, or incised, either from the edge inwards, at or towards the point or tip of any of the tongues or flaps, or in the body of the paper near to the point or tip of any of the tongues or flaps.

ELLIOTT, E., C. LEACH, and J. RATCLIFFE. *Improvements in machinery for spinning wool and other fibrous substances.* Dated Feb. 15, 1856. (No. 396.)

These improvements relate to self-acting mules, and consist in fixing to the bottom of the mule two long pieces of wood, upon which bearers are fixed for supporting a counter shaft; to one end of this shaft a pulley is fixed, instead of placing the same on the tin roller shaft, thus imparting motion to the tin roller shaft through the agency of the counter shaft, instead of direct to the tin roller shaft, as heretofore.

JOHNSON, J. H. *Improvements in fountain pens.* (A communication.) Dated Feb. 15, 1856. (No. 397.)

These improvements mainly relate to a previous patent, dated 24th Feb. 1854, and consist—1. In cutting away, or notching laterally the heel of the pen itself, whereby it is made to fit firmly on to the supplying tube, which has a corresponding recess formed to receive the pen. 2. In forming on the back of the pen, near the heel, a small elevation which bears against the inner side of the holder, and serves to prevent the pen from shaking or being unduly lifted when writing, &c.

NEWTON, W. E. *Improved machinery for making boots and shoes.* (A communication.) Dated Feb. 15, 1856. (No. 398.)

This invention consists of parts, whereby the shoe or boot, having been cut and lasted in the usual way, is held and pierced, the pegs cut and driven, and the shoe completely pegged with two rows around the sole.

HARRISON, G. *Improvements in axles for railway carriages.* Dated Feb. 16, 1856. (No. 402.)

This invention consists in forming compound railway axles as follows:—The patentee forms the inner ends of each separate axle with a collar, and when the two collars are brought together, and the axles placed in a line, they are held in that position by wrought iron caps and steps, each formed in two parts, the steps corresponding in shape to that part of the axle which they are intended to embrace and surround, so that when the caps and steps are screwed together, each axle shall be at liberty to rotate independently of the other one, and the two still be connected. Another mode is to connect the ends of axles together by a he and she joint, and to form a solid wrought iron box, made round and bored, and fitted up to receive inner boxes or steps of brass or iron, which are connected to the outer box by two screws to each step.

HYAMS, H. J. *Improvements in the construction of gas-meters.* Dated Feb. 16, 1856. (No. 403.)

This invention relates to dry gas meters, in which one side of the measuring compartments is formed of a flexible diaphragm, and consists—1. In connecting together the rigid parts of the moveable diaphragm, so that they may act together; that is, when one is moved by the pressure of the gas entering the meter, it will, by being connected to the other rigidly, move it also, and assist in delivering the gas from the meter. 2. In attaching the circular rotating plate of the rotary valve to a crank, whereby it is moved eccentrically. By this means the several apertures whereby the gas passes through the valve from one part of the meter to another are uncovered in rotation.

SLEIGH, W. W. *Producing motive power, which he entitles "the hydrostatic motive-power engine."* Dated Feb. 18, 1856. (No. 404.)

The principle by which this engine produces motive power "consists in counteracting, by means of wheels acting on and being supported by a disc, that portion of any force or pressure (produced by any suitable matter, solid, fluid, or liquid) which is in the direction opposite to that in which it is intended motion should take place, the said motion not depending upon nor being produced by the exit or escape of any fluid or liquid."

NEWTON, A. V. *Improvements in the construction of steam engines for the purpose of converting the reciprocating motion into a rotary motion, and for operating the slide valves.* (A communication.) Dated Feb. 18, 1856. (No. 405.)

Attempts have been made to employ driving curves, formed of a cylinder, with

screw-like projections upon it, or grooves cut into it, in combination with a piston rod, for converting a reciprocating into a continuous rotary motion. The inventor has discovered that the angles of the cross curves with the line of the axis of the curves should be made to approximate nearly to a right angle, and that the action of the piston rod should be applied indirectly to the surface of the guide curves, through the medium of wheels (placed upon the piston rod or cross head) of a considerable diameter.

THOMSON, J. S., and A. BARCLAY. *Improvements in printing and embossing textile fabrics and other surfaces, and in the production of apparatus to be employed therein.* Dated Feb. 18, 1856. (No. 406.)

This invention relates to the printing of carpets, &c., comprehending both an improved system of producing the printing surfaces, and improved machinery for applying such surfaces. The printing surfaces are prepared by combining a series of pins, types, pegs, or other details into such an arrangement or mass as will allow of a printing block being moulded therefrom.

HODGKINSON, H. *Improved machinery or apparatus for bleaching cotton, linen, and other woven or textile fabrics.* Dated Feb. 18, 1856. (No. 407.)

This invention consists in certain apparatus in which steam is employed, in combination with bleaching matters or drugs used in bleaching. A steam-tight casing is made in two parts, with a place at bottom to hold liquid: inside this casing there is a revolving wheel containing the fabrics to be operated upon. There is a tap and a perforated pipe at the bottom part of the casing, by which steam is admitted for boiling the bleaching liquid. The wheel is formed with sides, and has a series of buckets round its periphery, and openings at the bottom of each for the admission and emission of the bleaching liquid as the wheel revolves. There are openings made in the side of the wheel for charging and discharging the goods.

SICHEL, S. E. *Certain improvements in apparatus for weaving "ribbed" cloth and bands of "chenille."* (A communication.) Dated Feb. 19, 1856. (No. 413.)

This invention consists—1. In weaving ribbed cloth, and relates to a novel disposition of the "healds" of the loom, designed to prevent the wear of the same, and also to diminish the number of healds, and prevent the unnecessary twisting of the warps. In this improved apparatus for weaving, the stationary warp does not shed, but remains in its place, and the binder warp in passing over the stationary warp, first from left to right and then from right to left, is tied each time by the weft, forming a kind of ribbed fabric which, when subsequently printed, presents a similar appearance to tapestry. Only one heald is employed, made in three parts, termed semi-healds, and so arranged that the binder warp passes through an eye in the lower or semi-heald, which is tied below to a treadle. This semi-heald is attached at its upper part by two semi-healds (one of which embraces the stationary warp) to two independent levers moved by two distinct treadles. When one lever rises the binder warp is lifted by one semi-heald along one side of the stationary warp; when the other lever rises, its corresponding semi-heald lifts the binder warp along the other side of the stationary warp, and so on, the weft being thrown in after each upward and cross over movement. 2. In weaving bands of chenille by a similar disposal of the healds.

WITTER, F. A. S. *An improved stove.* (A communication.) Dated Feb. 19, 1856. (No. 414.)

This invention consists in an open stove for burning coal or coke, so constructed that it possesses the appearance of an ordinary fire grate, together with the advantages and conveniences of a portable stove.

BOWERS, W. H. *Improvements in the construction of railways.* Dated Feb. 19, 1856. (No. 415.)

This invention consists—1. In forming a sleeper or bearer of plate iron, curved and secured from spreading out by tie plates turned up at each end, and into which the curved plates are placed. 2. In forming a sleeper or bearer of plate iron and angle or T-iron combined. 3. In forming sleepers or bearers of plates strengthened by being formed on their under side as shown. 4. In forming a bearer or sleeper corrugated, the corrugations being circular, radiating from the centre. 5. In supporting the rails, sleepers, or bearers which have a corrugated or similar form, without the use of the ordinary fastenings, by displacing a sufficient portion of the bearing to admit of the rail and hold it in position. 6. In constructing a rail to form its own bearing. 7. In forming a clip or fish joint for securing the rails at their ends; it is formed in one piece of metal, which obviates the necessity for bolts, and divides the usual gap left between the rail ends into two of half the width.

COX, S. F. *Improvements in the manufacture of leather, and in machinery for that purpose.* Dated Feb. 19, 1856. (No. 416.)

This invention consists in the application of mechanism to the rubbing and scraping of hides, skins, and leather. The hide, skin, or piece of leather is carried by a cylinder, or by a moving bed, which presents it gradually to a revolving spiral bar, rib, knife, or rubber.

JACKSON, C. S. *An improvement in preserving and disinfecting timber and other substances.* Dated. Feb. 19, 1856. (No. 419.)

This invention consists in applying solutions of the salts of zinc and of iron, in combination, for preserving timber from decay, and disinfecting timber and vegetable matters, bilge water, &c.

MERRETT, W. G. *An improvement in trowsers and drawers.* Dated Feb. 19, 1856. (No. 420.)

Trowsers and drawers are made with an introduced piece of leather or other material at or near the seat, such piece being perforated to ventilate the same.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

BARBER, J. *Improvements in steam engines.* Dated Feb. 13, 1856. (No. 373.)

This invention consists—1. In causing the box or step which holds the crank-pin to slide upon a solid shaft or hollow tube, and giving it at the same time if desired a curvilinear motion. 2. In the employment of hollow crank-pins and hollow shafts for bearings in general, and also in a convenient mode of removing the crank-pin when required. 3. In arranging the parts of locomotives so as to obtain greater compactness and simplicity, by fixing at the underside of the boilers blocks, which they can move on. 4. In the arrangement of four cylinders and their working parts, so that they act in a direct line. The improvements are a continuation of the invention patented by the inventor Aug. 15, 1855.

PARSONS, W. *Improvements in spindles for locks and latches.* Dated Feb. 13, 1856. (No. 375.)

The inventor describes an arrangement of a threaded spindle and corresponding collars, &c.

MEYER, J. C. *Improvements in machinery for rolling metal.* Dated Feb. 14, 1856. (No. 377.)

This invention consists in so arranging rollers that round articles having shoulders or other inequalities may be rolled. The inventor places two rollers close to each other, revolving in fixed bearings in the same plane, and has a third roller mounted in adjustable bearings. The circumferences of these rollers have recesses corresponding to the inequalities on the articles to be rolled.

EMSLEY, J. *Certain improvements in tube spinning frames employed in spinning worsted-yarn and other fibrous substances.* Dated Feb. 14, 1856. (No. 381.)

This invention consists in the use of an instrument called a cleaner, constructed and operated as follows:—Into a piece of wood of nearly the same shape as the top of the cap, and fitting loosely therein, is fixed a stout piece of wire, over which are passed some cloth washers which fit the inside of the cap to be cleansed. In applying this to tube spinning frames, it is proposed to place one of the above cleaners opposite to each capped spindle, so that at each operation of "doffing" and "piecing," the cap, as it is removed from the spindle, has simply to be pushed over and upon its respective cleaner, and withdrawn therefrom perfectly cleaned.

COOPER, G. P. *An improved shirt-collar.* Dated Feb. 14, 1856. (No. 382.)

The inventor describes certain "all-round" collars formed without bands.

DOBELL, E. *Improvements in lamp-glasses or conductors of light.* Dated Feb. 15, 1856. (No. 395.)

The inventor forms glass-chimneys of a spherical form, with a cylindrical passage through them, to enclose the light.

ROCHETTE, A. P. *Improvements in treating soapsuds, to obtain products therefrom.* Dated Feb. 16, 1856. (No. 399.)

In this invention the soapsuds are first subjected to the ordinary process of precipitating the matters mixed with the waters. These matters are then either first pressed and then introduced into a vessel and carbonized, or the whole of the precipitated matters are subjected to a process of carbonization, by which various products are obtained, some being distilled off, and the others remaining.

GRANT, F. D. *A method of rendering printing-inks and wax odoriferous.* Dated Feb. 16, 1856. (No. 400.)

This invention consists in incorporating in inks employed in printing, as also with wax for artificial flowers, &c., essential oils or scents, to impart an agreeable odour and neutralize unpleasant smell.

PARKER, F. *Improved apparatus for affording exercise to the human body.* Dated Feb. 16, 1856. (No. 401.)

This invention consists in connecting together certain levers, treadles, wheels, springs, and weights, and combining them with a seat into an apparatus by the use of which persons sitting thereon may avail themselves of similar exercise in a room to that obtained on horseback out of doors.

JONES, M., W. B. ROWE, and W. PERRINS. *An improvement in ranges.* Dated Feb. 18, 1856. (No. 408.)

This invention is applicable where two ovens are constructed to a range, one above the other, and consists in causing the heat and products from the range to pass over the upper oven, then over the lower oven, then between the two, and away into the chimney.

DEFRIES, M. *An improvement in supplying oil to the burners of lamps.* Dated Feb. 18, 1856. (No. 409.)

A lamp is constructed with a vessel to contain oil like a moderator lamp, to keep a constant overflow to the burner. This vessel is cylindrical, and has within it a piston with a cupped leather around, so that the oil, by the descent of the piston, may be forced up to the burner. To the piston is connected a weight suspended to an axis in such manner that the piston may descend and unwind the cord by which it is suspended.

HALE, W. *Improvements in propelling boats or other floating bodies.* Dated Feb. 18, 1856. (No. 410.)

This invention consists in propelling by means of a stream of fire acting below the water-line, produced by the combustion of an inflammable composition compressed into an iron tube, the open end of which is contracted.

WALENN, W. H. *Improvements in saw-teeth.* (A communication.) Dated Feb. 19, 1856. (No. 411.)

This invention consists in forming improved cutting edges upon the opposite sides of saw-teeth, by means of a grooved recess or space between their sides, and also in bevelling or rounding the back of the teeth in a form corresponding to the recess.

GERBAUT, H. *Improvements in the manufacture of vinegar.* Dated Feb. 19, 1856. (No. 412.)

In carrying out this invention small charcoal, previously freed from its soluble and alkaline substances, is put in a wooden tub in a dark place of a constant temperature. This being exposed to the action of the oxygen of air is rendered acetous, by pouring in it several times pure vinegar in different proportions. A mixture of 12 parts of rain water with 1 of pure alcohol is then filtered at certain intervals through the acetous charcoal, after which the above process of rendering the charcoal acetous is to be repeated.

GEDGE, J. *Improvements in curry-combs.* (A communication.) Dated Feb. 19, 1856. (No. 417.)

The inventor makes the currycomb of leather, the rows to receive the teeth being so perforated that pointed iron wire screws may be inserted therein, and screwed out (when worn by friction) simultaneously.

GEDGE, J. *Improvements in pumps.* (A communication.) Dated Feb. 19, 1856. (No. 418.)

The inventor proposes casting the body of the pump together with the upper and lower boxes in one piece; receivers are placed immediately above and below these boxes, in communication with the suction and ascension pipes; plates of caoutchouc are placed in the body of the pump, intercepting the air, and receiving the cover or lid. A brass rod with a cylinder of lead encircled with caoutchouc forms the piston.

SAVORY, W., and H. ARKELL. *Improvements in apparatus for the passage of water and other fluids.* Dated Feb. 19, 1856. No. 421.)

The tubular passage through which the fluid is to flow is made with a chamber to receive a valve, one end of the spindle of which passes through a stuffing-box formed on a cover of such chamber. The valve is faced with vulcanized India-rubber, which rests on a projecting seat formed at the inner end of the tubular outlet. The inner end of the spindle turns in a recess on the interior, and the cover is fixed by screws. The valve opens against the flow of the fluid.

PROVISIONAL PROTECTIONS.

Dated August 21, 1856.

1954. William Heap, Demus Sharp, and George Knowles, all of Bradford, York, engine tenders. Improvements in the construction of furnaces for economizing fuel and preventing smoke.

Dated August 25, 1856.

1982. George Warriner, of Withernsea, York, operative chemist. Improvements in compounds for preserving, deodorizing, and fertilizing.

Dated September 6, 1856.

2074. Henry Dyer, of Plaistow, Essex, engineer, and George Dyer, of Gracechurch-street, London, jeweller. Improvements in freeing textile fabrics, cotton waste, and fibrous matters from oily and other impurities.

Dated September 23, 1856.

2225. John George Taylor, of Glasgow, Lanark, merchant. Improvements in fastenings, connectors, and couplings, and in the application thereof.

2226. David Ogilvy Boyd, of Welbeck-street, Middlesex. Improvements in constructing and arranging flues for the passage of air or smoke.

2227. Francis Wrigley, of Carlisle, Cumberland, engineer. An improved friction coupling for the transmission of motive power.

2228. Robert Winterbottom, jun., of Staley Bridge, Lancaster, corn dealer. Improvements in the mode or method of making or producing dry barm or yeast.

2229. Richard Husband, of Manchester, Lancaster, hat manufacturer. Certain improvements in the manufacture of silk hats.

2230. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improvements in gimlets, augers, and other tools which operate by a rotary motion. A communication.

2231. William Johnson, of Lincoln's-inn-fields, Middlesex, civil engineer. Improvements in machinery for doubling and twisting fibrous materials. A communication from E. Weber.

Dated September 24, 1856.

2232. Arthur George Baylis, of Redditch, Worcester, manufacturer, and John Green, of Red-

ditch, needle finisher. An improvement or improvements in the manufacture of needles.

2233. Andrew Barrie, of Edinburgh, watchmaker. A new or improved instrument or apparatus for registering the time at which workmen arrive at and leave their place of work, and for other such like purposes.

2235. James Cottrill, of Studley, Warwick, needle maker. Improvements in machinery to supersede hand labour in the operation of filing.

2236. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improvements in carding engines. A communication.

2237. Peter William Barlow, of Great George-street, Westminster. Improvements in the permanent way of railways.

2239. William Beatson, of Chemical Works, Rotherham. Improvements in puddling iron.

2240. Charles Vion, of High Holborn, London, Middlesex, civil engineer. Improvements in metallic moulds, and in the manner of using them for casting metals. A communication from J. Boy, of Paris.

2241. Victor Frederic Antoine Prost, merchant, of Paris, French Empire. Improvements in weaving and in the machinery or apparatus employed therein.

Dated September 25, 1856.

2242. Robert Brown, of Glasgow, Lanark, N. B., brassfounder. Improvements in tap or valves.

2243. Thomas Holmes, of Pendleton, Lancaster, bleacher, and Thomas Aspinall, of Pendleton, watchmen. Improvements for preventing or diminishing the production of smoke in fire-places and furnaces, and for effecting its combustion.

2244. Joseph William Wilson, of Banbury, Oxford, engineer. Improvements in machinery or apparatus for manufacturing parts of brooms and brushes.

2245. Carlo Sayno, mechanician, of Novara, Piedmont. Improvements in bearings, beds, or sockets for axles, pivots, or other rotary parts of machinery.

2247. Etienne Sabatier, of Paris, France, priest. Improvements in the permanent way of railways.

2248. Henry William Parnell, of Bryanston-square, London. The construction of ships and boats.

2249. Arthur Albright, of George-street, Edgbaston, Warwick. Improvements in the manufacture of lucifer matches, and of boxes suitable for containing the same.

2250. Robert Frost, of Steam Mills, Chester. Improvements in the manufacture of flour.

2251. John James Russell, of Wednesbury, tube-manufacturer, and Joseph Bennett Howell, of Sheffield, steel-manufacturer. Improvements in the manufacture of cast-steel tubes.

2252. Matthew Andrew Muir, of Glasgow, Lanark, N.B., machinist, and William James Walker, of the same place, manufacturer. Improvements in machinery or apparatus for sizeing or dressing yarns or threads.

2253. Samuel Calley, of Brixham, Devon, shipowner. Improved composition and compositions for coating or covering surfaces, particularly the bottoms of ships and vessels.

Dated September 26, 1856.

2254. Claude Langlois, of Bath, Somerset, artist. Improvements in photography.

2255. John Forster Meakin, of Baker-street, Portman-square, Middlesex. An improved fire-escape.

2256. Marius Pellen, of Rue d'Anjou St. Honoré, Paris, merchant. Rendering impermeable by gas, caoutchoue, gold-beaters' skin, paper, gauze, and similar materials used for things adapted to receive an ascending force such as balloons, aerostatic machines, toys, &c., &c., by the application of a peculiar varnish.

2257. Charles Renshaw, of Dukinfield, Chester, engineer and millwright. Improvements in squeezing-rollers applicable to machinery or apparatus for pressing or partially drying yarns and woven fabrics.

2258. William Horsfall, of Manchester, Lancaster, card-manufacturer. An improvement or improvements in cards for carding fibrous substances.

2259. George Gower Woodward, of Kidderminster, Worcester. Improvements in the manufacture of carpets.

2260. Frederick Ransome, of Ipswich. Improvements in the manufacture of artificial fuel.

Dated September 27, 1856.

2262. David Thom and George Aldcroft Phillips, both of Manchester, Lancaster, soap-manufacturers. An improvement in soap-frames.

2264. John Boyd, of Ashbocking, Suffolk, gentleman. Improvements in letter-press printing-machines.

2266. William Smith, of Skinner-street, Snowhill, London, and Nathaniel Fortescue Taylor, of Stratford, Essex, gas engineers. Improvements in apparatus for measuring gas and other fluids, and in regulating the flow of the same.

2268. John Montagu Hayes, Captain Royal Navy, of Portland-terrace, Southsea. Improvements in percussion-cap holders.

2270. John Rothwell, of Park-hill, Bolton, Lancaster. A certain composition and preparation to promote the ignition and combustion of coke, coal, and other combustible substances in stoves, furnaces, and grates.

Dated September 29, 1856.

2272. Luke Duncan Jackson, engineer, of Underwood, Nottingham, and Henry Myers, of Rathbone-place, Middlesex, medical practitioner. An apparatus for the better working of brakes in stopping railway trains.

2274. Charles John Carr, of Belper, Derby, engineer. Improvements in operating hammers and stamps.

2278. David Thom and George Aldcroft Phillips, both of Manchester, Lancaster, soap-manufacturers. Certain improvements in apparatus used in the manufacture of soap.

2280. John Lord, of Rochdale, Lancaster, flannel-manufacturer. Certain improvements in the process of separating or recovering animal wool or silk from cotton and woollen, or from cotton and silk, or other mixed fabrics, whereby the animal wool or silk is rendered capable of being again employed, which said improvements are also applicable to wool in its unmanufactured state.

2282. George Tomlinson Bousfield, of Sussex-place, Loughborough-road, Brixton, Surrey. An improvement in the manufacture of artificial stone. A communication.

Dated September 30, 1856.

2284. Samuel Ivers, of Halshaw Moor, near Bolton-le-Moors, Lancaster, mechanic. Certain improvements in looms for weaving.

2286. Robert Craib Ross, of Glasgow, Lanark, N. B., engineer. Improvements in paddle-wheels or propelling apparatus for ships or vessels.

2288. William Gostwyck Gard, of Calstock, Cornwall, engineer. Improvements in bits for boring and sinking.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," October 14th, 1856.)

1309. S. R. Parkhurst. Improvements in paddle-wheels for steam-boats and vessels.
1305. V. J. B. Mauban. Certain improvements in the manufacture of cans for holding oil and other liquids.
1314. G. J. Mackelcan. Improvements in the manufacture of rollers adapted to calico and other printing.
1330. E. Hatton. Improvements in the manufacture of plain and ornamental metallic tubes.
1345. D. Lang. Improvements in obtaining and applying motive power.
1359. W. D. Ruck and V. Touche. Improvements in the manufacture of paper from fibres not hitherto applied to such purpose.
1360. S. Dyer. Improvements in reefing, furling, and setting the sails of ships and vessels, also for protecting such sails from wet and other abuses caused by ropes and rigging.
1365. R. Ferrier. Improvements in machinery or apparatus for sweeping and cleansing roads and streets.
1375. R. A. Brooman. Improvements in printing shawls and other fabrics, and in the machinery employed therein. A communication.
1383. H. B. James. Improvements in moulding metallic castings.
1385. W. Bayliss. A new or improved manufacture of ornamental metallic tubes.
1407. H. Mége. Improvements in the manufacture of bread.
1461. G. Davies. Improvements in apparatus for measuring and indicating the leakage of vessels. A communication.
1466. J. C. L. Lacroix. Filthing and shaving the merino, plain satin, and muslin of wool.
1475. I. Atkin and M. Miller. Improvements in machinery for sewing lace and other fabrics.
1605. H. Page. Improvements in ornamenting or decorating glass.
1640. T. Charlton and W. Turnbull. Improvements in steam generators.
1687. C. Carey. Improvements in the vessels and filters used for making infusions of coffee and other substances.
1728. A. V. Newton. Improvements in machinery for reaping and mowing. A communication.
1807. C. J. B. Torassa. Improvements in obtaining motive power by the aid of explosive gases.
1828. R. A. Brooman. Improvements in the manufacture of artificial fuel. A communication.
1842. C. F. Vasserot. Improvements in machinery for cutting nuts, screws, and pieces of polygonal shape. A communication.
1879. E. E. Amyot. Improvements in the preparation of pulp for paper, pasteboard, and other uses for which pulp is required.
1987. C. Carey. Improvements in shower-baths.
2040. J. Lamb. Certain improvements in machinery or apparatus for preparing, slubbing, and roving cotton and other fibrous substances.
2161. A. V. Newton. An improved preparation of phosphoric acid. A communication.
2163. R. Walker, jun. Improvements in ascertaining the draught of water and trim of ships or vessels.
2180. G. Davies. Improvements in apparatus for actuating railway brakes. A communication.
2214. J. Roberts and J. Beech. A new or improved railway chair.
2218. W. Taylor. Improvements in the conversion of cast iron into steel and malleable iron.
2236. A. V. Newton. Improvements in carding engines. A communication.
2241. V. F. A. Prost. Improvements in weaving, and in the machinery or apparatus employed therein.
2249. A. Albright. Improvements in the manufacture of lucifer matches, and of boxes suitable for containing the same.
2250. R. Frost. Improvements in the manufacture of flour.
2251. J. J. Russell and J. B. Howell. Improvements in the manufacture of cast steel tubes.
2252. M. A. Muir and W. J. Walker. Improvements in machinery or apparatus for sizeing or dressing yarns or threads.
2260. F. Ransome. Improvements in the manufacture of artificial fuel.
2282. G. T. Bousfield. An improvement in the manufacture of artificial stone. A communication.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1853.

2295. John Henry Johnson.
2310. Henry Richardson Plimpton and James Leonard Plimpton.
2313. William Edward Newton.
2329. James Worrall, jun.
2334. William Henry Muntz.
2335. James Webster.
2336. John Francis Porter.
2339. John Morison and Daniel Hurn.
2348. Charles Scott Jackson.
2350. Charles Scott Jackson.
2355. John Elce.
2366. Andrew McLean and William Fraser Rae.
2375. Charles Coates.
2408. John Wright Child and Robert Wilson.
2421. William Russell.
2469. Edward Austin.
2603. William Rodger.

LIST OF SEALED PATENTS.

Sealed October 10, 1856.

1856.

872. Robert Davis.
874. James Mash.
879. Robert Baird Lindsay.
880. Edwin Heywood.
884. Robert Richardson.
888. Joseph Barrans.
892. Leonard Kaberry and Aaron Horsefield.
893. Alfred Vincent Newton.
898. Thomas Jeffries.
946. François Jean Bouwens.
952. Joseph Auguste Marie Touët Chambor.
1107. John Henry Johnson.
1546. George Edward Dering.
1559. William Henry Hubbard.

1586. Robert Shaw.
1814. William Coltman.
1880. Chapman March.

Sealed October 14, 1856.

882. Patrick Robertson.
883. John Symonds and Thomas Mara Fell.
895. Hugo Frederick Forbes.
909. William Edward Newton.
911. William Armitage and Henry Lea.
915. Henry Young Darracott Scott.
1009. Thomas Restell.
1033. Richard Archibald Brooman.
1048. Henry Atwood Thompson.
1057. William Bulmer and Isaac Sharp.
1091. Léon Louis Jardin and Joseph Blamond.
1198. David Shaw.
1653. Pierre Beauplant Rassant.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

The paper of J. S. Holland and the letters of S. A. Good and W. H. Herbert are deferred.

J. A. D.—We cannot continue the discussion to which your letter relates.

A. Casey.—We cannot undertake to supply such information as you require.

E. A. S.—The mechanical means you mention would be very useful.

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LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1733.] SATURDAY, OCTOBER 25, 1856. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

LACY'S APPARATUS FOR TAKING-UP AND DELIVERING MAIL-BAGS FROM RAILWAY-CARRIAGES.

Fig. 1.

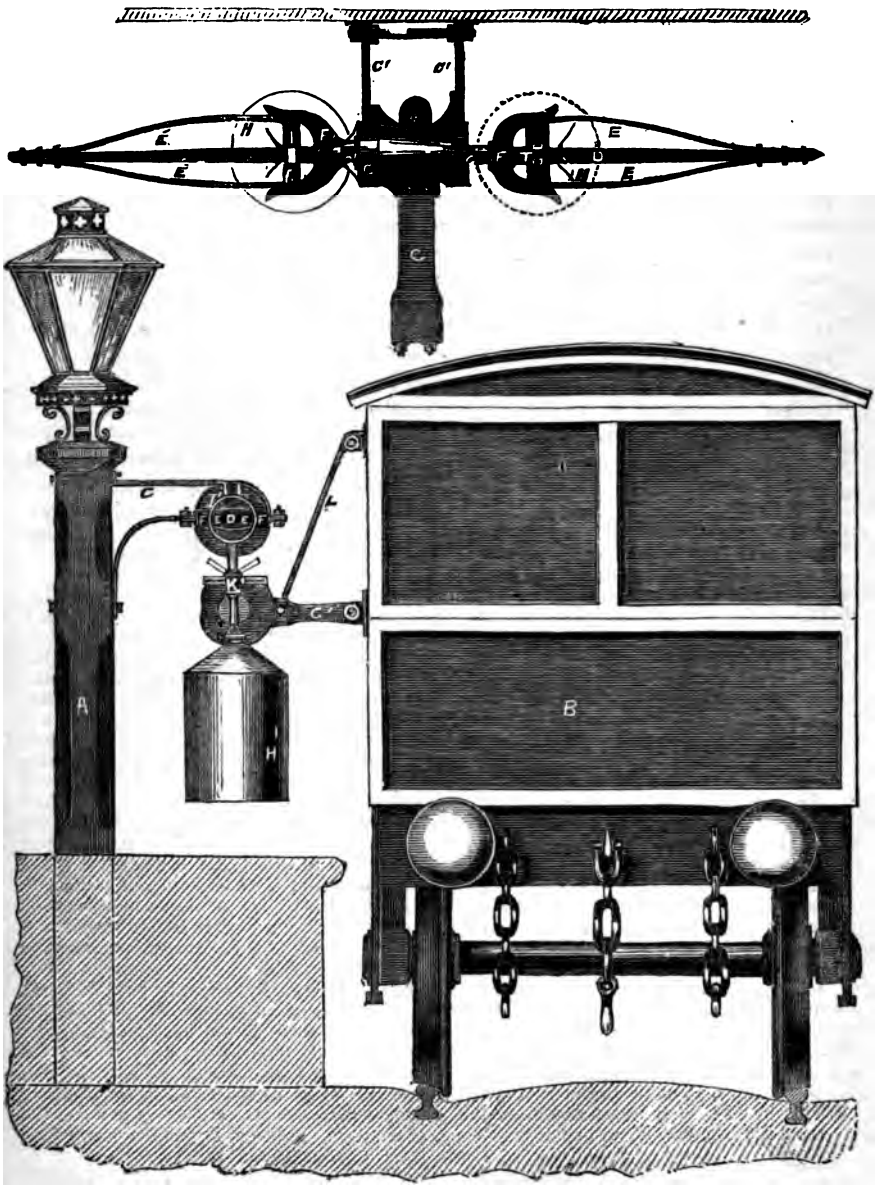


Fig. 2.

LACY'S APPARATUS FOR TAKING-UP AND DELIVERING MAIL-BAGS FROM RAILWAY-CARRIAGES.

MR. AUGUSTUS DACRE LACY, of Hall House, Knayton, Yorkshire, has patented the invention illustrated in the accompanying engravings, which has for its object the safer delivery of the bags or packages from the train on to the line of railway, so as to obviate the present liability to injury from shock or concussion produced by the sudden transference of the articles from a train in rapid motion to a stationary apparatus or receptacle on the line; also combined therewith a safer means of taking up the articles by the moving train from the stationary apparatus on the line.

The apparatus on the line of railway consists of a bracket or support, extending from a post fixed into the ground at the side of the line of rails, such bracket or support carrying a bar, which extends in a direction parallel with the line of rails. At the end of this bar is fixed a pair of springs, of such form as to be capable of receiving the ring of the bag or package as it is delivered from the moving carriage, and gradually to offer resistance to its motion until it is passed into a retaining hook and there held, such retaining hook being connected with a spring, so as to lessen the concussion occasioned by the ring passing into the hook. The apparatus on the carriage or carriages consists of a support, mounted on a pivot fixed to the side of the carriage, and carrying a similar bar with springs, to lessen the motion of the bag or package by partially resisting the motion of its ring, and also a retaining hook with spring, to lessen the concussion of the ring on entering the hook; also, on the box containing the kind of buffer spring in connection with the hook, both on the stationary apparatus applied on the line and on the apparatus applied to the moving carriage or carriages respectively, there is a socket capable of receiving a kind of neck attached to the bag or package, and there holding the latter after it has been delivered from the moving carriage, or in readiness to be taken up thereby, as the case may be.

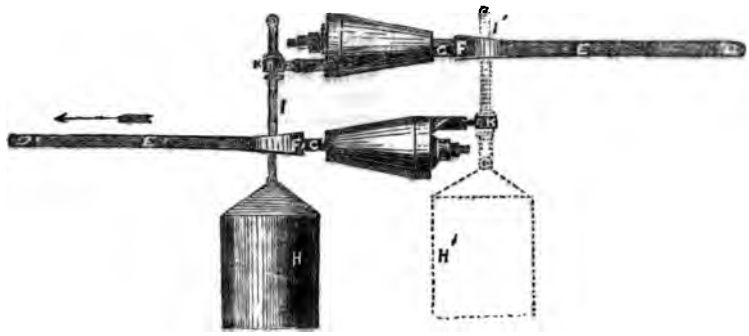
The stationary apparatus on the line and that applied to the carriage or carriages possess the same means of delivering and taking up the bag or package as required, and of reducing the effects of concussion occasioned by the sudden transfer of the article from the train in motion to the post at rest, and *vice versâ*.

Fig. 1 is a plan or horizontal view of the apparatus as applied to the carriage and the line of railway exclusively; fig. 2 is a side elevation of the same apparatus; and fig. 3 represents the post on the line, and the carriage of the train, with the apparatus on each, in end view. A is the post on the line of railway; B is the carriage of the train; C is the bracket or support for the apparatus on the post; C′ is the support for the apparatus on the carriage; D is the bar, carried by the bracket or support, C; and D′, a corresponding bar, carried by the support, C′. In each case the bar, D or D′, has springs, E or E′, fixed to it on each side, so as to be capable of offering some resistance to the motion of the bag or package towards the hook by pressing against the inner surface of the ring as it passes along the springs. F is the hook of the apparatus belonging to the post, and F′, that of the same belonging to the carriage. At the back of this hook in each case is a rod, G and G′, extending to a kind of buffer spring, shown by dotted lines. H is the bag on the bracket of the post, which is being taken up by the carriage as it passes; and H′ is the bag on the carriage which is being transferred to and left on the bracket of the post. I is the ring of the former bag or package, and I′, that of the latter; K and K′ are the sockets in each apparatus respectively in which the necks of the bags are held. In these sockets there are springs, as shown, in order to retain the neck of the bag after it has passed into the fork of the socket. L is a rope, by means of which the apparatus on the carriage may be lowered or drawn up as required.

The action of the apparatus is as follows:—As the carriage, B, passes the post, A, in the direction of the arrow, the bag or package, H′, will be drawn out of its socket, K′, and its ring, I′, will be made to embrace the springs, E E, the pressure of which, in resisting their collapsing by the ring, will retard the motion of the bag towards the hook, F, and the pressure of the ring against the hook will be taken by the spring connected with the rod, G; the ring, I′, of the bag or package will then be retained in the hook, F, and the bag will thus be safely transferred from the moving carriage to the stationary post; at the same time the bar, E′, will enter the ring, I, of the bag or package, H, and the force of the

concussion of the ring, I, against the hook, F′, will be counteracted or suitably lessened by the resistance of the springs, E E′, and that on the rod, G′, when the bag or package will

Fig. 2.



be drawn out of the socket, K, and retained by the hook, F′, and will thus be transferred from the stationary post to the carriage of the passing train.

ASTRONOMICAL EXPEDITION TO THE PEAK OF TENERIFFE.

Professor C. Piazzi Smyth, the Astronomer Royal for Scotland, has returned from his astronomical expedition to Teneriffe, which was undertaken with the sanction of the Lords of the Admiralty, chiefly for the purpose of ascertaining how much astronomical observations can be improved by the elevation of telescopes into the higher regions of the atmosphere. In order to facilitate the inquiry, Mr. Robert Stephenson very liberally gave up to Professor Smyth the entire use of his fine yacht, *Titania*, and its crew of sixteen men, for the whole period of the expedition. The loan of instruments of value by the Astronomer Royal, Mr. Pattinson, of Newcastle, Professor Stokes, Mr. Gassiot, Mr. Nasmyth, Captain Fitzroy, Dr. Lee, and Admirals Beechey, Manners, and W. H. Smyth, also contributed greatly to the success of the expedition.

From the date of the sanctioning of the expedition by their Lordships, Professor Smyth was closely occupied in preparing the necessary instruments (signally assisted in some of the more difficult parts by the Astronomer Royal) until the 20th of June, when he embarked on board the yacht, *Titania*, at Southampton, with about seventy cases of instruments and materials. After a prosperous voyage, during which he was enabled to accomplish, by novel, mechanical, and optical contrivances,—namely, his "free revolver stand" and "spontaneous horizon point"—two important desiderata of nautical astronomy noted in the "Admiralty Manual of Scientific Inquiry," and to ascertain the necessity of a new but large correction for marine barometers, he cast anchor at Santa Cruz on the 8th of July. On the 10th he proceeded overland to Orotava, the real port of the Peak, while the yacht went round by sea to the same place, and landed all the packages, as well as her carpenter and second mate, who were to serve as assistants on the mountain.

To determine neatly and definitely the question above-mentioned as the chief subject of the expedition, in the style of a problem in pure mathematics, three stations should have been chosen; one at the base, the second half-way up, and the third at the summit of the Peak; and such had, in fact, been recommended. Professor Smyth was prepared therefore to set up his instruments at Orotava as the first station; but finding that this town, and all that part of the country, were under continual cloud, thick, dense, and determinedly constant, he soon turned his attention to a higher station. He gave the preference to Guajara, a mountain 8,870 feet high, on the south of the Peak, and on the 14th of July started for this place with twenty-seven horses and mules, and nearly all his baggage. Not the whole of it, for the very untoward circumstance had just been discovered that the form, size, and weight of the boxes of the great Pattinson equatorial were entirely unsuited to the means of transport in the country. He was therefore compelled to leave them behind, provisionally, it was hoped, while he was acquiring experience of the country and of the astronomical qualities of the atmosphere with the smaller and more portable Sheepshanks equatorial of the Edinburgh Observatory.

Travelling, then, with his cavalcade, he

began to ascend the long slope above Orotava, on a densely clouded day; but, after some hours, he had penetrated and finally risen above the clouds, the cumuloni of the north-east trade wind, at the height of above 5,000 feet. This was immediately a realization of one of the astronomical advantages of elevation; for the sun now shone out hot and clear from a dark blue sky, unspecked by a particle of vapour—a state of things, too, which the characteristics of the plants and the dryness of the soil he was entering on proved to be the rule and not the exception of that upper region. Finally, ascending through a pass in the southern wall, he and his party climbed the hill of Guajara, encamping that night among the trachyte and pumice blocks with which its summit is strewed. The morning showed that they were on the highest point of land in the island, except the Peak itself, which rose about three miles to the north of them, thus leaving the horizon clear east and west, where some of their observations were to be made. But, the site being open and exposed to every wind, and with a deep precipice, part of the old crater wall, running along the northern side, their first exertions were directed to securing the station by building stone walls about the tents. To this end they procured native assistance, and erected also an optical room, a meteorological shed, and a telescope enclosure.

In astronomy, the admirable purity of the atmosphere and the advantage of an ascent of 8,870 feet were night after night proved by the limit of vision of the Sheepshanks telescope being extended from stars of the 10 deg. magnitude to those of the 14 deg. at Guajara, and not only the brightness of the stars, but their definition also was much improved; "for, while in Edinburgh," says Professor Smyth, "I had never seen good images of stars in that instrument, on Guajara it almost always exhibited such clean and perfect stellar discs and rings as I have never seen in any other telescope at or near the level of the sea;" and while he was still on the mountain, with almost every night perfectly clear, and in general with enchantingly fine definition, the perception of these advantages was intensified by the arrival of a letter from the first assistant-astronomer of the Edinburgh Observatory, saying that there had hardly been a single clear night there during all the time the Professor had been away.

The conclusions derivable from the purely astronomical observations are confirmed by many of a different character, and especially by the observed intensity of the radiation from the heavenly bodies. Thus, the first radiation thermometer exposed was broken a few minutes by the power of the sun proving to be so much greater than had been anticipated by the maker in England. Two other thermometers were then brought out, that had been prepared according to M. Arago's idea and the greater strength of the sun in France; but, though marking as high as 180 deg., they were soon proved to be insufficient to register the extraordinary intensity of the sun's rays there; for by 10 o'clock in the morning the mercury had not only reached the top of the scale (180°), but was filling the upper bulb to an unknown extent.

This excessive radiation abundantly proved that Guajara was precisely the place for the normal series of actinometer observations required by Sir John Herschel. For this purpose two actinometers at least were necessary; but up to the time of leaving England neither the professor nor his friends could hear of the existence of more than one. That one belonged to Mr. Airey, and he not only lent it to him, but ordered a second one to be made and sent out to Teneriffe as soon as possible. Unhappily, it only arrived as he was leaving the island, on the 26th of September, and then in a damaged condition, while the other one, when opened on the mountain, was found to have been injured in its most essential part—the internal thermometer—as well as to have leaked. Means, however, of getting over these difficulties were extemporized, and observations were begun in that region so promising for solar radiation; but on the second day the gradual shrinking of the wooden parts of the apparatus split the glass parts—"the end," says Professor Smyth, "of too many of our instruments in that climate, where, besides the direct radiation, there reigned a continual dryness, with a severity unmitigated, beyond any precedent known to the opticians at home."

Happier was the inquiry into the radiation of the moon by means of the Admiralty delicate thermomultiplier, lent by M. Gassiot. The position of the moon was by no means favourable, being on the night of the full, 19° south of the equator; but the air was perfectly calm, and the rare atmosphere so favourable to radiation, that a very sensible amount of heat was found both on this and the following night. The absolute amount was small, being about one-third of that radiated by a candle at a distance of 15 feet; but the perfect capacity of the instrument to measure smaller quantities still, and the confirmatory result of groups of several hundred observations, leave no doubt of the fact of their having been enabled to measure here a quantity which is so small as to be altogether inappreciable at lower altitudes.

(*To be continued.*)

THE VULCANIZATION OF INDIA-RUBBER.

No. VI.

THE importance of the improvements in gum-elastic for educational purposes has been briefly commented upon in previous portions of these notices, and we would now give a little additional space to some of the many purposes in this direction which assist in filling up the almost infinite measure of the uses of vulcanized India-rubber. More might be justly written upon the subject of some of them, and too much could not well be said in commendation of others. Much has to be done to perfect them, but enough has already been accomplished to prove that the cause of education will hereafter be promoted by the use of many articles made of the vulcanized fabrics. The cheapness of some of these articles compared with the cost of those of other materials, gives double assurance of the correctness of this view. The expensiveness of globes, for instance, which are admitted by all to be by far the best means of imparting and obtaining geographical and astronomical information, has rendered them accessible to few persons, either pupils or teachers. The adaptation and application of gum-elastic to these purposes will bring within the reach of every youth in the commonest school a pefect globe at a price within their means, and maps more durable than leather or parchment at cheaper rates than paper maps are now made when mounted on linen.

Although some of the articles we are about to describe more properly belong to the department of stationery, and others are only articles of accommodation or convenience for schools, yet for the sake of conciseness, and to give a comprehensive view of the whole, we shall treat of them here as "educational."

By allusion to two improvements of modern times, one in stationery—the letter envelope—the other the method of teaching with outline maps, our readers will perhaps the better appreciate the value and timely introduction of caoutchouc bound paper and illustrated outline maps and map carpets.

The advantages of the method of teaching geography by the use of outline maps was apparent, and the system was partially introduced, by the use of paper maps, previous to the introduction of caoutchouc, for like purposes; but their cumbrous bulk and liability to damage, besides their expensiveness when mounted upon linen presented an obstacle to the progress of the improvement in this method of teaching geography, so that a suitable material upon which to print these maps became a desideratum. The timely application of gum-elastic tissue and vellum to this use, meets the necessity of the case.

The binding of paper, as we shall proceed to describe, is another improvement, the demand for which is the more imperative in consequence of the introduction of the letter envelope, which has of late years come into general use, and which has become almost indispensable for the comfort and convenience of every one who has any considerable correspondence. This change in the use of paper for letter writing demands a corresponding change in the manner of putting it up for the market, and ere long it is but reasonable to infer that what we now glance at will be the rule and not the exception from its obvious common sense and rational economy.

The method of binding paper referred to, is an improvement which superadds cheapness to neatness and convenience. A coat of gum elastic cement is applied to the edges of the paper on the back of the ream, much after the manner that drawing "blocks" are now done only on one side, and over it a sheet of thin gum-elastic vellum for the purpose of a binding. Quire marks are also bound in between the quires or half quires; these being either pieces of tissue paper, or a sheet of paper differing in colour from the general mass. It is made yet more convenient at a trifling extra expense when sheets of blotting paper are bound between the quires. By this method of putting up paper the separate quires in the reams are always kept in their place, and each sheet in the quire until wanted, and every inch of paper left in using parts of sheets is kept bound until taken out, and while the quire is being used, there is but one sheet outside or underneath to get soiled. A much more important item in the account of its convenience and utility, is that when a sermon, a deed, a contract, or other article is written upon the quires, which may involve a greater or less number of sheets, the pages may be written consecutively until the deed or other document is finished, and when cut from the ream, the document becomes a bound book of the strongest kind, so far as holding the sheets securely is concerned. The delay or inconvenience of stitching or fastening a document with eyelets, &c., is not encountered, which by the ordinary method has to be done, if at all, at the last moment of executing a deed, when it is most inconvenient, and persons are in the greatest haste. The document bound in this way, lies open where it is desired, and does not occasion trouble by constantly closing; besides that, there is a saving of from one to two inches of paper,

because the whole of the sheets may be written upon, quite to the extreme, there being no margin required as in the case of fastening by stitching or eyelets. The convenience in the use of this paper may be aptly compared to that of the letter envelope, only the improvement may be said to be as much more important as the consumption of writing paper is greater than that of paper for envelopes.

It is reasonable to suppose that in the first manufacture of foolscap and letter paper, it was folded chiefly that it might be used in the form of a book, when the sheets were stitched together at the back; that it might be conveniently retailed by the quire, and also in letter writing, that the half sheet not written upon might be folded for the direction. The bound paper will be found preferable in all these particulars. In a brief correspondence, when folded paper is used, there exists the necessity of remitting a half sheet that is not required, or of sending a torn half sheet, either of which is objectionable; both of these objections are avoided in the use of the bound paper, the sheets being put in the market without folding of any size required. It is probably not very far from the truth to suppose that as much writing paper is wasted as is necessarily used. Here then, at least for the present, is the problem solved of "where shall be found supplies of paper?" If we could save 100 per cent. of letter paper by *any* means, the supply of the raw material for the newspaper and printed books would be increased *almost* in the same ratio. The use of a few quires of bound paper will satisfy any one that in addition to the comfort it otherwise gives, a very large share of this waste may be avoided.

Some method by which books could be more securely and expeditiously bound has long been desired, both by publishers and the public. By the use of the vulcanizing process this object is now attained, and specimens are produced, both with the ordinary bindings and the vellum and tissue bindings, as well as the magnificent relievo covers in the hard vulcanite, which it will be our duty to describe hereafter. This satisfactorily demonstrates the value of these improvements.

Mr. Goodyear does not claim the notion of binding books by means of India rubber. It was first attempted many years ago in England, and it was also tried in the United States, as early as 1836; but it is well known that India rubber not vulcanized is too perishable a substance for any such application. The result has been that such attempts, after producing considerable excitement, and raising the expectations of the public, have proved failures. In this instance a very different consequence has followed, and there is no reason to doubt its continued and permanent success.

One of the inconveniences attending books in the common way is, the difficulty of holding them open so as to be read at the inner margin; and the same remark applies to blank books, with still greater force, in regard to the difficulty of writing up to the back, until the backs are sufficiently broken or worn to admit of it, by which time the leaves are usually so loosened as to fall out. This new method of binding admits of the book being opened quite flat or level, and durability is thus likewise secured. The expense is, moreover, less than the plan by glue and stitches, and the saving will be greater, and the advantage yet more apparent in blank books than any others, excepting books of music. In addition to the above, Mr. Goodyear has made an improvement in the manufacture of covers of expensive books and ledgers, by forming them from whalebone, with elastic compound for the backs; and the improved covers will, it is believed, be found more durable than any heretofore made of other materials. A fabric is made of vulcanized gum, elastic tissue, and vellum, for the covering and binding of cheap publications; and of gum elastic corded vellum, of different thicknesses, made in imitation of Russia leather, calf-skin, and morocco, for more valuable works. The superiority of this material, as a binding or covering for books, consists in the facts that it does not crack or warp, is not injured by worms, water, or oil, and is readily cleansed when soiled. Besides, it allows of any style of ornament, in the highest perfection. Admitting that these fabrics, whether gilded or otherwise embossed, or plain, possess the advantages for bookbinding that are claimed for them, another and a greater recommendation will be their cheapness and economy, as those which are designed as substitutes for morocco, calf, and Russia leather may be afforded at nearly the same price as cambrics and paper, and at about the price of the cambrics now used for binding.

The outline maps which we have seen are printed upon the vulcanized India-rubber fabrics, both transparent and opaque, and also upon various articles to be used for other purposes besides maps, such as piano covers, crumb cloths, and carpets. Arrangements are being made for this manufacture which may facilitate the method of teaching from outline maps by printing on this material maps of the world upon a scale large enough for "papering" the sides of an ordinary-sized room of a school-house,

academy, or public lecture-room or dwelling. The same map, when suspended at a suitable distance from the wall, with lights placed behind it, may be used as a transparency for teaching at night. A series of sectional maps printed on a scale as large as can be conveniently printed upon calenders, after the manner of calico-printing, may be cemented together, and arranged upon rollers. With the map of the world before the pupil or audience, the geographical position of each country may be readily explained; and it is obvious that, by the use of such a series of maps as a transparency, together with the map of the world and the illuminated globe, the study of geography may be taught with a saving of time and expense, and may also be taught to those whose sight does not admit of close study at night, as well as to those who have no leisure hours to devote to study except at night. It occurs to us, however, that the perfection of this system will not be attained until skilful artists shall have turned their attention to the subject for the purpose of illustrating the maps by the best designs and most truthful representations of the scenery, productions, and costumes of the inhabitants of the different countries, and blending these with the geographical outlines. Nor need we allude to the panoramic representations, so popular of late years, as proof of the interest that may be given to this description of science, teaching now too much neglected for the want of such facilities. When the plates or calenders are once executed, the printing of these maps will be not more expensive than the ordinary printing of calicoes, so that sets of them will be brought within the reach of any individual or institution that can afford the expense of atlases or maps of any kind. Outline maps for the use of schools, printed upon this material, without illustration, are already offered for sale by the licensees of Mr. Goodyear, as also crumb-cloths, table-covers, piano-covers, with maps printed upon them, it having been proved that these impressions are sufficiently durable, not excepting carpeting, which is exposed to hard service. The maps filled in with names of places, &c., are printed upon vulcanized India-rubber, vellum, drapery, and tissue. Drapery is used for pocket-maps, and vellum for those that are mounted. The advantages over paper which are claimed for maps of this sort are very many. They possess an intrinsic value for many other purposes besides those of instruction. They may be used with impunity as table or bed-covers, or, in fact, as common crumb-cloths. They may be doubled and folded any number of times, and handled without care. They may not only be washed, but also boiled in hot water, or soapsuds, without injury to the substance, or the printing, or the colouring. They are useful for schools, as they can be brought to the desk of the pupil, instead of his being compelled to climb to find out a particular locality. In fact, they appear to us all that is needed for the educational objects the teacher has in view. We must pass over other descriptions of maps, as shown to us at 47, Leicester-square, where, in the theatre of the defunct Western Literary Institution, is to be found an intellectual resuscitation in the shape of vulcanite, which has amply compensated for any regret which may have been attendant upon the decay of a once valuable society.

The globes, however, we cannot dismiss thus briefly. We have already hinted at their existence, and were certainly not prepared to find that their construction was capable of being carried out with such perfection as an inspection has assured us of. The globe has heretofore been so expensive as to be found in schools only of the higher class. No form of map or atlas can give so correct an idea of the surface of the earth, or of the relative situation of places as a globe. One of three feet in diameter may be made a complete atlas. An attempt appears to have been made by Mr. Goodyear to make them of gum elastic soon after the discovery of the "acid gas process." Specimens were at that time made of the pure sheet-gum, cured by the acid process. These attempts have been followed up at intervals until the production of the present process. They have been made of the knit goods, coated florence, and the plated fibrous fabrics. On many accounts it would seem the last-named fabric and sheet gum may in general be best for this use. They are made of various sizes, and when embossed by the method described in the manufacture of hollow ware—by steam and vulcanization—they may be made to supply the present deficiency of globes for the blind. Their utility and importance to the cause of education need not, we are sure, be insisted upon, when it is understood that any child can be furnished with a perfect globe at a price to come within ordinary means. When used, they are inflated with air; and when collapsed, may be folded in so small a compass as to be no incumbrance under any circumstances. When the large sizes are filled with hydrogen they become highly ornamental and beautiful objects.

DECIMAL MEASURES AND WEIGHTS.

THE FRENCH METRICAL SYSTEM.

THE decimal system of France appears to have originated in a proposition of Prince de Talleyrand, when Bishop of Autun, in the year 1790. The bishop recommended the length of the seconds pendulum as a standard; but a committee of the Academy recommended a quarter of the meridian, divided into 10,000,000 parts, one of which should be the standard. This was adopted by the Academy, and afterwards by the National Assembly. That the bishop and Academy should favour a natural standard, is not to be wondered at. On that point philosophers have been nearly unanimous. In England the seconds pendulum has been the general favourite; it has also received great favour elsewhere. No doubt but a natural standard looks exceedingly well on paper, is highly philosophical, and works very nicely in scientific calculations, when there is occasion to use its base. But there are other people in the world besides philosophers, and other calculations besides dynamical and geodetical ones. A system of measures and weights ought to afford the greatest convenience to the greatest number. What reason have we to conclude that the base of such a system is to be found in nature? Plain practical mechanics, when they intend to make an implement of any kind, first consider the uses it will be put to, the kind of people who are to use it, and then adapt it as much as possible to its being handled with ease and facility by those who are to use it. They never dream that the Creator has so fashioned the world that a decimal part of its quadrant, or a measure deduced from its gravity, would give the best length for a tool of any kind.

The pendulum is, *by Act of Parliament*, 39·1393 inches long, and the metre 39·37079 inches. Such lengths could never be made to serve for a mechanic's rule; and yet there is nothing in the whole range of measures and weights of anything like the importance of the foot-rule; if a system break down in that particular, it breaks down altogether. If it fail to give to the mechanic as good a rule as the old pied, or the English foot, it is a failure indeed. See the number of uses to which a mechanic puts his foot-rule, where the metre would be entirely useless. A good slide-rule is a ruler, a straight-edge, a bevel, frequently used as a square, a gauge, &c., &c. The sun never sets on the English foot-rule; it is always in use, its uses are so many. By means of its slide, it forms a perfect gauge for measuring the depth of oles, and the internal diameter of cylinders, *ithin its range*, and offers a ready and useful calculating machine, the use of which is easily learnt. Place the metre alongside of the foot-rule, and it will be seen at a glance that the rule is as superior to the metre as a locomotive is to a wheelbarrow. What would Fairbairn, Maudslay, Penn, or Whitworth say, if they saw one of their mechanics take a metre out of his pocket, unfold it, place it on the nearest clear surface, to straighten its ten decimetres, then call upon another workman to "lend a hand" to use it; after using it, proceed to fold up the nine-jointed, snake-like monster, and put it in any one of his pockets indiscriminately? Would they say it was a time-saving instrument? They would prefer the old rule, with all its faults, and they are not little ones; but give it four-eighths of an inch more length, so as to make it contain 100, instead of 96 eighths, and thus make it decimal, and you have a rule nearly perfect, and fit to become the fundamental unit of a system of measures and weights. If it were possible for a country to have no measures whatever, and wanted a system, if they took a base more than half an inch longer or shorter, they would not have such a good one.

Next in importance to the mechanics' rule, comes the measure for corn. The best corn-measure must be that which contains as much as can conveniently be lifted by two men and emptied into a sack, the men working the whole of a usual day. The old Winchester bushel contained 2,150 cubic inches, the imperial contains 2,218, and the "Victorian" 1,953. If the French use a strictly decimal corn-measure, it can only contain 610 cubic inches. Three times the size would be too small, four times too large, and, if either were used, where would be the decimal system? No English farmer or corn-merchant could patiently stand by and see men frittering away their time in measuring corn in a peck measure. Here, again, the metrical system is at fault in a most important particular. No merits in other parts can at all compensate for these two damning defects. Never has any country lost so good an opportunity of introducing a good decimal system. The people were in the humour to change everything—their constitution, their religion, their God—anything whatever. Had the savans given the mechanics a pied of a reasonable length, they might even have foisted upon them a number of crackjaw words of four and five syllables as names for its proportions. The chance has gone for ever, and left the French, as they always have been, with more measures and weights than any other people. This is the result of being philosophical instead of practical—of going to nature for that which, *à priori*, they had no

reason to expect she possessed, viz., a good base for a system of measures. By this unfortunate choice of a base, the general adoption of a decimal system has been deferred half a century at the least.

The advocates for a natural standard speak of its being easily recovered, if lost; but surely, if proper care were taken, there could be little risk of its being lost. After the first, copies could easily and cheaply be made. If one were placed in each of our large towns, and each of our colonies, and one were sent to the principal capitals of the world, there could be little danger of the whole being lost at once. "But the nation may decay, and its institutions die out, and a natural standard would enable future antiquaries to know what our measures were." Cassini and La Hire had brought before the Academy the question of the ancient Roman measures. Cassini tried to find out the Roman road measures from the distances, given by Roman writers, of certain well-known places; but the roads had undergone change, and it was uncertain from what part they had measured. La Hire tried to find the length of the Roman foot from two which were on the sepulchres of two architects, and from the measure of certain Roman ruins; but these things had decayed. Had the Romans used a natural standard, the French savans would have been spared some trouble, if *the Romans had also left behind them the very instruments they used in finding that standard*, &c., &c. But it is a far-fetched philanthropy that would adopt an unwieldly standard for the gratification of future antiquaries. To bother the mechanics of France with such a thing as the metre, in order to gratify some New Zealander at a future day, while sitting on a broken column of the Louvre, contemplating the ruins of Nôtre Dame, is neither politic nor benevolent. But "a natural standard saves time to philosophers in making certain calculations." Granted. A convenient rule in the hands of a mechanic saves time in earning his daily bread and raising his country's taxes. Compel, if you could, the whole of the mechanics of France to use the metre for one week, and there would be more valuable time lost than would be saved by the whole of the savans in a century.

But to recover or verify a natural standard is not such an easy task after all; its possibility even admits of question. Suppose the French were fortunate enough to lose the metre, and unfortunate enough to desire to recover it, they would have years of difficulty, great expense, and then none engaged in the task would be bold enough to say that they had succeeded. The following sample of degree-measuring offers little encouragement for an earth standard. The figures give the toises in a degree according to the authorities whose names are prefixed:

Fernel	56746
Snell	51766
Norwood	57412
Picard	57060
The two Cassinis	57097
Jacques Cassini	56960
Maupertius & three others	57422
Swavsberg	57196
Rosenberger	57405
Boguer	57648
La Condamine	57649
Delambre	56739
La Caille	57034
Mason and Dixon	56888
French Metrical System..	57008

Earth-measuring appears to have been a favourite operation with the French. They measured an arc, then disputed it, re-measured it, disputed again, prolonged it, still doubted it; now making the earth a prolate, then an oblate spheroid; and each operation conducted as if to settle the question for ever, yet each time committing errors which were seen almost immediately afterwards; never getting two results to agree, yet, wonderful to relate, they come to the conclusion that this unmeasurable quantity is the best possible basis for a system of measures and weights. Perhaps, without being aware of it themselves, their real motive was to have another spell at earth-measuring. They had appeared so many times upon the stage "for the last time," that there was little chance of their treading their favourite boards again, except they should receive a "royal command;" and here it was. Now a great occasion calls forth all their energies, and this time there is to be no mistake. The operation is to be conducted on a grand scale, and the length of a degree determined to an "effigraphy." Practice makes perfect, and they had had the practice; yet, after all, they only succeeded in adding one more to the long list of failures. Delambre shows in the *Connaissance des Temps*, year 1823, page 241, that the meridian is not 40,000,000 metres, but 40,002,892, and to-morrow it may turn out some other length which shall be disputed the next day. Hear the author of the "History of Astronomy," in the "Library of Useful Knowledge." Speaking of the measure of the French Commissioners, he says:

"In this measure the repeating circle was used exclusively for both the geodetic and astronomical angles. The value of this elegant and ingenious instrument appears to have been overrated by the French astron-

mers; and it seems to be thought at present that the latitudes at the extreme points of their arc are not so certain as could be wished. This is more particularly the case with Formentera, where the latitude was found with a repeating circle, having a fixed level attached to it—a construction justly esteemed objectionable. It has also been ascertained that the best repeating circles are subject to errors of a very perplexing kind, which can only be eliminated by observing stars to the north and south of the zenith. This precaution was not always taken in the French survey!"

The same writer, a little further on, says: "It is to be feared that the comprehensive views of the French philosophers have not been answered. The metre, as far as we know, has not been adopted in other countries. In many continental works of science, the old French toises and feet are still used; and as these denominations are now given in France to measures comprising two metres and one-third of a metre respectively, the confusion is greater than ever."

It is true that this was written some years ago; but it was at least thirty years after the introduction of the metrical system. If a person speak to us of French toises, aunes, pieds, pouces, livres, &c., we want to know whether they are of the old or new dimensions; for the metrical system has nearly doubled the old difficulties in each particular district of France. When strenuous endeavours are being made for the introduction of the French metrical system into England, it ought to be generally known what difficulties the French have had, and what doctoring the system has been subjected to, and all through the unfortunate choice of a natural standard.

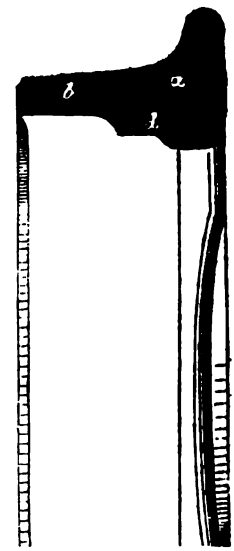
J. Simon Holland.

(*To be continued.*)

MURRAY'S IMPROVED RAILWAY WHEELS.

Mr. G. Murray, of Whitehill Point, Northumberland, proposes in the specification of a patent lately completed, to add a malleable iron crease to a cast-iron railway wheel, and enumerates the following as advantages to be derived from his improvement: "First, a cast-iron wheel is rendered as effective as a malleable iron wheel, at one-half of the cost; secondly, the breaking of the wheels is prevented; thirdly, in the event of breakage, the wheel is bound together by the manner in which the malleable iron crease is fastened to the wheel; fourthly, it is not necessary to turn the wheel in a *lathe, as is the case* with wrought-iron wheels; and, fifthly, the process of attaching the crease to the wheel hardens the crease in a manner which cannot be applied to malleable iron wheels."

The accompany engraving represents a half-section of a wheel so constructed. The manner of proceeding is as follows:—A cast

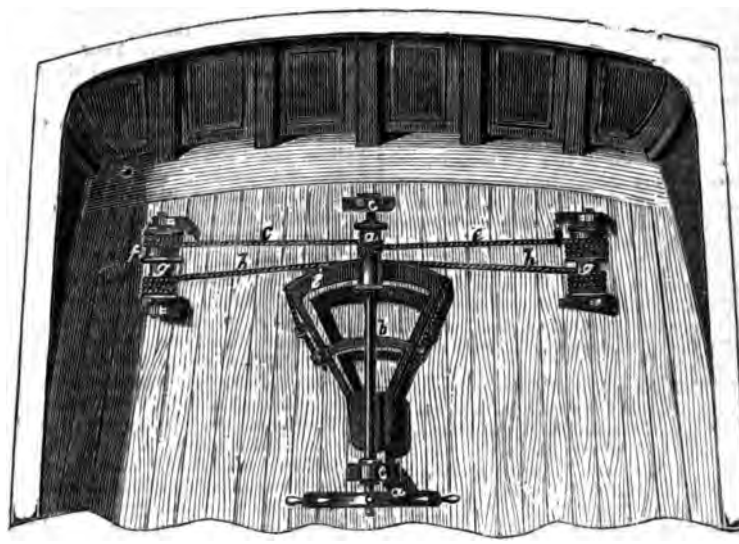


iron wheel is cast in the same manner as those in ordinary use in a cast-iron case for the purpose of case-hardening the trod or tire of the wheel. The shape of the wheel is, however, different in the following particular: In the trod or tire of the wheel a rebate of two inches wide is constructed to receive the crease; the rebate extends from the rim or outer edge of the tire towards the middle of the tire, and is one-eighth of an inch deeper towards the middle of the tire than it is on the rim or edge. The crease *a*, is made of rolled malleable iron made to fit the rebate, and to project sufficiently from the trod, *b*, of the wheel to prevent the wheel from quitting the rails of the railway. The crease, *a*, is then formed into a hoop, and when it is hot is fitted on to the cast-iron wheel on the side, *d*, of the wheel where the rebate is formed. In cooling, the crease contracts, and the rebate being deeper towards the middle of the tire, the crease, by means of this bevel, grasps the wheel, is prevented from being forced off, and binds the wheel together. "The crease of the wheel," says the patentee, "being subject to little wear and tear, the wheel with a wrought-iron crease will last longer."

PEGG'S PATENT STEERING APPARATUS.

Mr. Joseph Pegg, shipowner, of Monk Wearmouth, Durham, has patented an invention which relates to a mode of steering vessels without the use of blocks or pulleys, and of removing the necessity for keeping the chain slack to allow the wheel moving round. This object he proposes to effect by the employment of an arrangement of barrels for transmitting motion from the steering wheel through a segment or other lever to the rudder, and thereby increasing the leverage, so that one helmsman shall have a perfect command of the rudder even in boisterous weather.

The accompanying engraving shows the improved steering apparatus in plan view. *a* is the steering wheel, keyed to a shaft *b*, which turns in bearings in the standards *c*, *c*.



To this shaft *b* is keyed a barrel *d* to receive the coils of a rope or chain *e*, the opposite ends of which are attached respectively to barrels *f*, *f*, which are free to turn in bracket bearings affixed to the deck of the ship. Keyed to the same spindles which carry the barrels *f*, *f*, or forming a part of those barrels, are the smaller barrels *g*, *g*. From each of these barrels *g* a tiller rope or chain *h* proceeds to a segment shaped tiller *i*, which is secured in the usual way to the rudder head. The tiller ropes are secured at one end to their respective barrels *g*, and their other ends are laid over the segment face of the tiller (which is provided with double grooves to receive the ropes and keep them apart), and secured to the tiller by tightening screws. It will be understood that the chains will always remain tight without detracting from the power exerted by the helmsman, as no friction takes place in the working of the apparatus, whereas great friction is produced when the chains run through blocks. "The advantage," says Mr. Pegg, "of making the barrels *f*, *f*, of larger diameter than the barrels *g*, *g*, is that the steersman has a greater leverage, which enables him to work the rudder more quickly, and to hold the wheel more firmly than heretofore in a heavy sea way. The least motion of the wheel acts immediately on the tiller, which is not the case when blocks are used, as the slack necessary to allow them to work generally requires one or more revolutions of the wheel before the tiller is acted upon. This apparatus also prevents the shaking and jerking of the rudder against the stern post, which motion has occasioned many vessels to leak about those parts, and it also removes the annoyance so often complained of by passengers, of the rudder thumping against the stern post, and the rattling of the wheel chains."

This invention can be applied to the straight tiller, but more efficiently to the segment. The invention can also be applied to vessels where the steering wheel and the stern post are necessarily separated, as is the case in ships driven by a screw propeller, where the shaft or opening to lift the screw propeller out of the water is situate between the stern post and the standards of the steering wheel. Under these circum-

stances the barrels *f* and *g* are situate at the opposite extremities of a pair of shafts through which the motion from the steering wheel is communicated to the segment lever on the rudder head.

DEATH OF GEORGE STEERS.

THIS eminent naval architect met with a sudden death on the 26th Sept., and our country has been deprived of one, in the very vigour of manhood, being only thirty-seven years of age, who has rendered his name famous throughout the world. While proceeding in a waggon to Long Neck, Long Island, to bring home his wife, his horse ran away, and having jumped out of the waggon with a view of stopping the animal, he was struck by the waggon, and prostrated senseless on the middle of the road. In this situation he was discovered by some persons who knew him, and who were riding in a carriage; he was then instantly taken up and driven to his house in Cannon-street, this city, where medical aid was quickly obtained, but was of no avail; the spirit departed at ten o'clock in the evening.

In 1853 the name of George Steers became a national theme of praise, on account of the splendid triumph of the yacht *America*—of which he was the builder—in England. It then won the prize as the fastest yacht of all nations in a contest with the yachts of the Royal Club. Since then he has built the yacht *Julia*, which has carried off the prize in every regatta which she has entered. He was selected, from his known ability, to build the great steam frigate *Niagara*—the only one of the six new frigates constructed by private parties; he was also the naval architect of the *Adriatic* —the new Collins steamer. Both of these great steamers are splendid specimens of his skill, but he has not been permitted to witness their full completion; death has closed his eyes before they have been able to make their trial trips, which are expected to come off this month.

Although cut off so suddenly, he has lived long enough to leave his mark on the pages of history—a nobler one than that of many distinguished statesmen—he was the builder of the yacht *America*.—*Scientific American.*

SOCIETY OF ARTS' PREMIUMS.

IN accordance with its usual practice, the Council of the Society of Arts have issued a list of desiderata as subjects for premiums to be competed for. The subjects enumerated are very various, and too copious to *be given at length* in our pages; we therefore recommend our readers to obtain the three last numbers of the *Journal of the Society of Arts*, in which the list is given at length.

J. C. LOUDON THE ORIGINATOR OF SCIENTIFIC DICTIONARIES.

PERSONS well acquainted with the secrets of Paternoster-row, assert that it was the late Mr. Loudon, who suggested to the firm of that locality the idea of those *dictionaries* which have since been compiled on every branch of science, and the monetary exponent of which may be now about £500,000. Mr. John Longman (the founder of the firm) resided then permanently in the Row, and it was at the symposia there held that Mr. Loudon, then a man in full vigour of mind, darted forth this prolific idea, which was first realized in the "Encyclopædia of Gardening." Then came the "Encyclopædia of Agriculture," and, finally, the "Arboretum et Fruticetum Britannicum," which, however, Mr. Loudon was obliged to undertake at his *own* risk and expense, which partly obscured the latter years of his life, as the expense was very great, only to be reimbursed by a gradual, and, in such a high-priced work, slow sale. Then came the "Geographical and Commercial Dictionary," that of "Arts, Manufactures, and Mines," made by other hands. But the publishing of Mr. Loudon's works, compiled with such great tact and knowledge—works which were on the table of every possessor and cultivator of land, exercised a wonderful influence; and there are people who positively (and perhaps *truly*) assert, that if England is in many parts resembling a garden, the praise is due to Mr. Loudon. I had the honour, and I may still more truly say the pleasure, of being often the guest of Mr. Loudon in his then modest country dwelling in Bayswater—evenings which I shall ever remember. Mr. Loudon was a man who, like Pestalozzi, exercised, by the depth of his character, a powerful traction on every sensible mind. There was not an atom of weakness or emptiness about his character; a glance at him, a word of his, often filled up one's own whole mind. What astonished me most was, that Mr. Loudon, bred a gardener, engaged about top dressing, turnips, and dahlias, was a person from whom no recess of human thought, no depth of metaphysics, seemed to have escaped. Like Columbus, who notwithstanding compasses and *bous-sole*, wrote works, "Das Prophecias," &c., Mr. Loudon discussed freely on the causality and harmony of the organic world, and other dogmas of Pantheism. Although we might place the "*circumspice*" on almost

every garden of England, the *country* is bound to honour his memory!

"Nicht ihm, euch errichtet
Ihr monumente!"—GOETHE.

"It is not to him, but to yourselves, that you raise monuments!"

J. LOTSKY.

15, Gower-street.

CAOUTCHOUC (INDIA-RUBBER) AND ITS ADULTERATIONS.

To the Editor of the Mechanics' Magazine.

SIR,—Your readers must be good enough not to lose sight of the fact of "specific gravity," and test all the above goods, made with pure, unadulterated India-rubber, by their floating upon water. Any deviation from this is a proof of some cheap stuff unfairly introduced. It will be just in proportion as they keep themselves well posted up in this matter, that manufacturers will be shy of throwing into their caoutchouc such mad and infamous proportions of cheap adulterations, and drive them (*for they will not volunteer*) to the necessity of manufacturing from the pure gum, and thus place better disposed traders upon a more just footing, and enable the latter to compete (if needs be) upon their own terms, or upon recipes supplied by the engineer. Another fact must not be lost sight of, and that is the use of "*light carbonate of magnesia*," which, mixed with the gum, does not increase its density, as will in some measure be illustrated by the recipe I shall now figure out, merely remarking, that a somewhat heavy carbonate was used, as well as in an unroasted state, and hence the somewhat increased density. This article is worth the attention of buyers of rubber goods, as in a moderate quantity it reduces the cost, without correspondingly injuring the manufacture. (*Light buffer spring—just sinks in water.*)

Grind together	£	s.	d.
25 lbs. clean Java rubber, at 7d.	0	14	7
5 „ Para rubber, at 1s. 11d.	0	9	7
10 „ common magnesia, at 4d.	0	3	4
25 ozs. pure sulphur, at 6½d...	0	0	10
Mill cost on 41 lbs., at 3d.....	0	10	3
Cost 11d. per pound.....	£1	18	7

Sells at 2s. 9d. per lb.

This is brown at first, but in a few days the sulphur blooms over the surface grey or white, and would lead an amateur to judge they were of that colour throughout. Buffer springs and other moulded goods from this compound are a little heavier than Messrs. Mackintosh and Co.'s A-density railway spring, at 4s. per lb. gross, and were made at first to meet it, and sold at 2s. 9d. per lb. net. It is a most useful spring, and in competition should be bought at 1s. 3d. to 1s. 6d. per. lb. net, but I should strongly recommend that engineers try a substitute of all "Java gum," by obtaining a few, *away from their usual manufacturer* ON TRIAL, as I believe their quality as a spring would not be injured, and the price would be reduced, and, moreover, it would guard against the manufacturer being tempted to do so, without reducing the charge.

For the guidance of engineers, I remark, that a spring of this quality and dimensions $4\frac{1}{2} \times 2\frac{1}{2} \times 1$ pressed to half an inch, showed $3\frac{1}{2}$ tons on the dial, and one with equal quantities of oxide of zinc and magnesia, of same size, &c., indicated $1\frac{1}{2}$ tons on equal pressure, while the quality of Mackintosh and Co.'s, referred to before, and of which this was an imitation, marked $1\frac{3}{4}$ tons on the dial. Of course, a spring with a smaller bore than $2\frac{1}{2}$ inches would show greater tonnage.

The next recipe is for grey packing, which is largely and exclusively used by some dealers for valves for marine engines, &c., as well as in sheet; and if the price (3s. 6d. per lb.) was not excessive for so much adulterated matter, I would pass it over in silence as a very fair and useful article, and if approved, my form will enable the engineer to obtain it much cheaper by competition. Say, then,

Grind together	£	s.	d.
25 lbs. Para rubber, at 1s. 11d.	2	7	11
5 „ cleaned Java, at 7d....	0	2	11
16 „ oxide of zinc, at 3½d...	0	4	8
6 „ carbonate of magnesia, at 4d.....	0	2	0
3 „ porcelain or Cornwall clay.	0	0	1
2 „ red lead, at 3d.....	0	0	6
30 ozs. pure sulphur, at 6½d...	0	1	0
Mill costs on 59 lbs., at 3d.	0	14	9
	£3	13	10

So that it costs 1s. 3d. per lb.; and hence I submit that 3s. 6d. per lb. is excessive, with discount from 10 to 20 per cent. Unless the magnesia in this packing is well calcined it will cut porous, but does not show in valves cut to shape before vulcanizing. It may seem I lay too much stress upon high prices, and if the goods were bought in trifling quantities, it would carry argument; but as the orders are usually large, and show good monied invoices, there is a wide margin for reduction; besides, in many cases these long prices prohibit the use of caoutchouc. *The prices are about right, if the goods were of pure India-rubber.* In my next paper I will treat of the best

class of goods, and, if space, will touch fully the curing or vulcanising by steam heat.

I am, Sir, yours, &c.,
W. H. HERBERT.

Mitcham Common, Sept. 20, 1856.

ORNAMENTAL CHIMNIES.

To the Editor of the Mechanics' Magazine.

SIR,—At Dundee I lately noticed a peculiarity in the form of the factory "stalks" or chimnies, which renders them extremely ornamental, and entirely removes the isolated and unmeaning appearance they usually present. These chimnies have square sides, and the top of each is finished by a pyramid resting on arches. I was informed that the upper structure is shaped in this way to moderate the draught, but the change certainly converts these ugly brick columns into handsome obelisks, and the classic effect thus produced is imparted to the whole town.

All attempts to ornament chimnies by adding a capital to the top, as if it were to crown a pillar must be failures, because a column without anything upon it (unless it be a ruin) always suggests the idea of incompleteness. By finishing the chimney with a pyramidal apex, on the other hand, we at once desist from forcing it into the columnar order, and allow it to become, what it most resembles in colour and proportions—an Egyptian obelisk.

J. M.

Temple.

BALANCE SLIDE-VALVES.

To the Editor of the Mechanics' Magazine.

SIR,—In your number of the 27th September last there is a description of a balance slide-valve, which is stated to be the invention of an American gentleman, and patented in this country in the name of Mr. R. A. Brooman. The steam is admitted through the face or seat on which the valve works, and the valve-box is filled with steam of a lower pressure than that which enters the cylinder, the pressure being reduced by means of a self-acting regulating valve.

I am requested by Messrs. William and John Galloway, of Manchester, to inform you that this mode of arranging the slide-valve, and balancing the pressure upon it, was patented by them on the 14th March, 1855, and therefore about a year previous to the date of the first-mentioned patent.

I am, Sir, yours, &c.,
CHARLES COWPER.

20, Southampton-buildings, Chancery-lane, Oct. 16, 1856.

DR. LARDNER AND THE MOON'S MOTION.

To the Editor of the Mechanics' Magazine.

SIR,—Mr. Good's "discovery" about the motion of the hands of a clock is the same kind of discovery as the several propositions of Euclid are to a boy at school who successively masters them,—a discovery to himself, for the first time obtaining some slight acquaintance with the rules for the composition of velocities; but no "discovery" to the rest of the world: and it was this hint that I intended to convey to that gentleman in my last letter, though he seems somewhat dull in taking it.

I for one fully admit the soundness of Dr. Lardner's investigation of the moon's motion; but I utterly deny the soundness of Mr. Good's "curious fact" deduced therefrom, that Dr. Lardner, every time he takes a walk, must be in reality proceeding *towards every point of the compass at once.* This piece of nonsense is Mr. Good's own, and as he contents himself with stating it without attempt at proof, he must excuse me if I decline the unprofitable task he so kindly proposes to me of explaining the nonsense he thinks himself justified in propounding to the world. It is clear from the tenor of his letter that he totally misapprehends the principle of composition and resolution of velocities; and I cannot help recommending to him a little of that humility, which as a teacher, he no doubt inculcates on his pupils, and which would teach him not to rush into print before he is quite sure he has mastered his subject. I quite excuse Mr. Good's "dulness" in failing to verify my inference from the theory of "Messrs. Hopkins, Symons, and Co.," that the earth rotates 364 instead of 365 times in the year. When he has got a little more perfect in the A, B, C of the composition of velocities, this may cease to be so great a mystery to him. Until then I commit it to his serious consideration, and probably we shall hereafter hear of another little discovery with regard it.

I am, Sir, yours, &c.,
A LOOKER ON.

London, October 18, 1856.

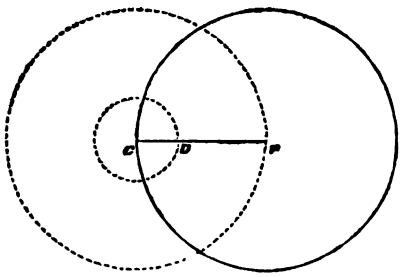
ROTARY MOTION OF WYLD'S GREAT GLOBE.

To the Editor of the Mechanics' Magazine.

SIR, -It may be an interesting novelty to not a few of your readers, that, on the hypothesis of the earth's diurnal motion necessarily causing Wyld's Great Globe to rotate on its axis parallel to the earth's axis, it must result, in describing a circle, that the fixed extremity of the given radius will

at the same time describe the circumference of another circle, of which the centre is the revolving extremity.

Let CP be the perpendicular from C, the centre of Wyld's globe upon P, a point in



the earth's axis, and let CD be the radius of the globe coincident with CP.

By Dr. Lardner's "Euclid," (11th edit., page 6), "If a right line of a given length revolve in the same plane round one of its extremities as a fixed point, the other extremity will describe the circumference of a circle, of which the centre is the fixed extremity."

Therefore, since CP revolves about the extremity P as a fixed point, the extremity C describes the circumference of a circle whose centre is P; but, by hypothesis, CD revolves about C as a centre, therefore CP being CD produced, also revolves about C, and the point P describes the circumference of a circle whose centre is C; that is, *the fixed extremity of the radius describes the circumference of a circle, of which the centre is the revolving extremity.*

Corollary.—Hence it appears that, on the same hypothesis, the earth's centre revolves about every point on its equator, and the earth's axis about every meridian.

I am, Sir, yours, etc.,

S. A. Good.

Her Majesty's Dockyard, Pembroke Dock, Oct. 11, 1856.

MORE ABOUT THE MOON.

To the Editor of the Mechanics' Magazine.

Sir,—Gazing of late at that surprisingly grand nature spectacle, the eclipse of the moon, several thoughts and recollections came upon me, of which I may be allowed to place one in your spirited Magazine I shall relate what the known Russian globe-circumnavigator, M. Chamisseau, told me once, and which probably he did not like to print in Germany. It may seem incredible; still, comparing it with what Captain Grey tells of the *Natural Magic* of the New Zealanders, it will easier *go down*. M. Chamisseau told me, that, "being at Radak (?) one of the South Sea Islands, he was told of a certain conjuror (*savant*), whose acquaintance he having made, he requested him to exhibit some of his grand performances. The *savant* appointed the next night as the time of the exhibition. They went together to the shore, where the full moon just shone glaringly over the heaving waves of the Pacific. Having both sat down, the savage took a piece of comestible (bread?) from under his clothes, and pronouncing three times a name which sounded like "Emma," he began to eat part of that substance. But, lo! as he began to diminish the piece of bread, the full moon also seemed to decrease in size, and so successively as the bread diminished the moon followed the same wake, until it had vanished altogether!" When M. Chamisseau had concluded his narrative I looked at him with astonishment. But he said that I need not be astonished, as what he told me was the *plain truth!* As there may be persons in Berlin to whom he might have told the same event, they will corroborate my recital.

J. Lotsky.

15, Gower-street.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

Laming, R. *Improvements in purifying gas, in preparing materials useful for purifying gas, and in apparatus to be used in purifying gas and disinfecting gas liquors or washings.* Dated Feb. 20, 1856. (No. 424.)

Claims.—1. The use of quick lime mixed with any deliquescent substance for removing moisture and naphthaline from gas. 2. The use of one and the same portion of water, to wash gas after it leaves a gas holder. 3. The manufacture of materials useful for purifying gas by peroxidising either at a low adequate temperature, a lower oxide of iron artificially distributed, either by itself or in combination with an acid in earthy matter, or in a mixture of earthy matters capable of neutralising the acid if any be combined with the iron, the said materials not containing any porous substance of a combustible nature. 4. The use of such perforated diaphragms in vessels for washing or scrubbing gas as are constructed each of two horizontal planes placed one a little above the other, the perforations of the two planes not coinciding vertically. Also the use of gas washers or scrubbers, each acting by a vertical and pervious diaphragm made of absorbent material kept wetted by water, diluted acid, or other purifying liquid constantly descending from top to bottom of the diaphragm, and through which the gas is made to pass on its way upwards through the

apparatus any number of times that may be requisite. 5. The use of certain apparatus described for disinfecting gas liquors or washings.

SMITH, T., and J. GILL. *Improvements in the mode or method of casing horizontal shafting.* Dated Feb. 20, 1856. (No. 425.)

The patentees make a tubular casing of light material, a little larger than the shaft, the whole length of it between the drums or pulleys. To the inside of this casing they fix collars which revolve with the shafting when there is nothing in contact with the casing; but if any obstruction takes place, the shaft will revolve inside the collars, and the casing remain motionless.

MUIR, W. *Improvements in slide lathes.* Dated Feb. 20, 1856. (No. 426.)

This invention consists in applying additional slide rests to slide lathes of the ordinary construction. (See *Mech. Mag.*, No. 1731, p. 337.)

KNOWLES, J. *Improvements in the construction of metallic pistons.* Dated Feb. 20, 1856. (No. 427.)

The improved pistons cannot well be described without engravings.

LYNN, W. *Improvements in the construction and mode of applying screws for propelling vessels.* Dated Feb. 20, 1856. (No. 428.)

This invention consists in casting the blades separately with a portion only of the length of the boss or eye cast therewith, and afterwards fitting the parts in such a manner as to secure them to the shaft, and form a solid screw when keyed up or fixed by collars. (See *Mech. Mag.*, No. 1730, p. 316.)

FREER, J. *Improvements in machines for planting grain and seeds, and an improved seed feeder and meter for planting machines.* Dated Feb. 20, 1856. (No. 431.)

The improved planting machinery consists of a number of planting wheels revolving in frames, and having round their circumference a series of planters. The frames of the planting wheels are fixed in a main framework at regular distances apart.

JOHNSON, J. H. *Improvements in machinery or apparatus for lubricating bearings, parts of which improvements are applicable to the raising or elevating of liquids.* (A communication.) Dated Feb. 20, 1856. (No. 434.)

In this invention a lubricating disc is fixed on to one or both ends of the journal to be lubricated, outside the bearing, working horizontally or obliquely. This disc rotates with its lower portion in an oil reservoir. A small oil collector or lipped scraper rests upon the upper portion of the lubricating disc. The oil, on being collected in the scraper, is directed by the pouring lip into the journal, over which it passes in its descent to the reservoir.

CLARK, J., and J. AUSTIN. *Improvements in apparatus for stoppering or closing bottles, jars, and other similar vessels.* Dated Feb. 20, 1856. (No. 435.)

This apparatus consists of a closed cap fixed on or in the neck of a bottle or other vessel, and fitted with a pouring lip in connection with an aperture in the top of the cap. The aperture and lip are made tight, by a plug or cover, fitting into or upon them, and attached to the end of a thumb lever acted upon by a spring to keep the plug firm in its seat.

AULD, D., and J. STEPHEN. *Improvements in steam boilers and furnaces and in apparatus connected therewith, and in the consumption or prevention of smoke.* Dated Feb. 20, 1856. (No. 436.)

This invention relates to so arranging steam boilers that they may be worked with both external and internal fires and flues in combination.

BARSHAM, J. *Improvements in the manufacture of cases or packings for bottles and jars.* Dated Feb. 20, 1856. (No. 438.)

This invention consists in producing tubular weavings, suitable for making cases or packings for bottles and jars.

JOHNSTON, W. O., and J. DIXON. *Improvements in cutting and working coal.* Dated Feb. 20, 1856. (No. 439.)

A carriage is employed on which is mounted an apparatus which is put in motion by compressed fluid. The apparatus on the carriage gives rotary motion to an axis which, when the machine is arranged for cutting along the face of the walls, &c., projects from the side of the carriage; this axis has upon it a series of cutters which are brought up sideways against the open side of a block or pillar, and as the carriage travels forwards cut a groove along the bottom of the coal, which then falls or is brought down by wedging.

MOLL, I. *The treatment of sulphate of alumine of commerce, and its formation of compounds useful for the disinfecting of organic substances in a state of putrefaction, as well as for other purposes.* Dated Feb. 21, 1856. (No. 440.)

The object of the invention is to bring into general use sulphate of alumine (of commerce) as a disinfectant. The inventor describes certain treatment which is to form a solid body capable of being reduced to a powder which can resist the action of humidity and of the atmosphere, at the same time preserving for the greatest part a facility of dissolution.

MAISSIAT, J. H. M. *Improvements in projectiles for fire-arms.* Dated Feb. 21, 1856. (No. 442.)

Claim.—The construction and use of projectiles in the form of a rigid rod or dart, either solid or hollow.

GREENE, J. D. *An improvement in breech-loading fire-arms.* Dated Feb. 21, 1856. (No. 447.)

This invention relates to closing the rear end of the breech by the employment of a self-adjusting thimble, patented by Moses Poole, 12th May, 1854. The improvement consists in forming an annular ring or recess in the rear end of the barrel, and in forming a flange or rim on the back of the thimble. The thimble is thus kept from entering too far into the barrel, and, when pressed up by the bolt, prevents any escape of gas on the firing of the charge.

CLARKE, W. *Improvements in the manufacture of warp fabrics.* Dated Feb. 21, 1856. (No. 448.)

These improvements relate to the production of a compound fabric, with regular ribs longitudinally on one surface thereof, similar to those produced in the stocking-frame, and by warp machinery in taffeta or taffita, and the other surface of a different character suitable to be raised into a pile or fleece, or which in the weaving may have a pile produced thereon, by the peculiar operation of two bars or sets of threads, one for the face and the other for the back of the fabric.

HEYWOOD, J. S. C., and G. LLOYD. *Improvements in condensing vapours in distillatory operations, the manufacture of varnishes, melting and distilling of fats and other manufacturing or chemical operations, and obtaining useful products therefrom.* Dated Feb. 22, 1856. (No. 452.)

The patentees' plan of operations consists in the use of a centrifugal fan to draw off the vapours as soon as formed, and at the same time mechanically mixing with them such proportion of atmospheric air or steam, or both, as may be found sufficient to effect condensation, and passing the mixture through pipes or condensers.

MOWBRAY, F. W. *Improvements in machinery or apparatus employed in spinning and doubling.* Dated Feb. 22, 1856. (No. 453.)

The patentee causes the yarn or thread whilst being spun or doubled to be laid on to the cop or pin at a much greater angle in one direction of traverse than in the other, by the employment of a cam or tappet (in place of the ordinary heart cam or tappet of a volute or such like form), with a rapid descent from the point of greatest radius to that of the least, which, whilst it admits of the progressive traverse in one direction, effects the rapid one in the other.

FIELD, J. K., and C. HUMFREY. *Improvements in the manufacture of paraffine candles.* Dated Feb. 22, 1856. (No. 454.)

The patentees take paraffine and melt it, and at about 140° Fahr. run it into candle moulds heated to the same temperature, or rather higher. The pipes thus filled are allowed to stand a few minutes to permit the air bubbles to escape, and are then plunged into cold water. The sudden cooling of the paraffine prevents its forming itself into crystals; the candles are nearly transparent, and draw freely from the pipes.

WALLACE, W. V., and B. L. SOWELL. *Improvements in treating tobacco in order to manufacture cigars and other articles for smoking, together with the manufacture of cigars and cheroots from the tobacco so treated.* (A communication.) Dated Feb. 22, 1856. (No. 455.)

This invention consists in first forming the leaves, or such portions of the plant as remain after removing the finest and best for the manufacture of cigars, into pulp, by the addition of liquid or steam thereto, and with the aid of suitable pulping machinery; then in forming the pulp into sheets, by passing it through rollers. The patentees then dry it, and cut it up into forms required for the manufacture of cigars, &c.

GRIFFITHS, J. *A new or improved brake for colliery and other steam engines.* Dated Feb. 22, 1856. (No. 456.)

The patentee employs a brake in which pressure is exercised upon a toothed wheel instead of a smooth pulley, as usually practised.

BOWER, L. *New or improved machinery for the manufacture of screws.* Dated Feb. 22, 1856. (No. 457.)

Claim.—The use of moveable cutters in conjunction with the ordinary worming tools of screw-making machinery, for forming a taper wormed point, or gimlet point.

STRANG, W. *Improvements in ornamental weaving.* Dated Feb. 22, 1856. (No. 458.)

This invention relates to sewed goods. The yarns or threads for forming the ornamental device are contained in small cylindrical boxes (or shuttles), the thread ends issuing from small apertures in the front ends, inside which they are dipped between spring plates to give them the requisite tension. These boxes lie in a series of angular troughs or seats fixed to the frame by separate brackets, leaving spaces between to permit of the rising of the warp threads, and the angular points of the troughs are directed downwards so as to divide the rising warp threads. The boxes are shifted across by downward projecting plates fixed to a bar capable of sliding in a groove in the top of the frame. These plates descend sufficiently far to push the small shuttles across when the bar is shifted transversely (which may be done directly by hand, or by means of a contrivance similar to the "lappet wheel.") A further improvement consists in using two, three, or even more rows

of shuttles or boxes with their troughs or carrying details in one frame, each row being shifted by means of a separate sliding bar.

TOUCAS, G. *A new metallic alloy.* Dated Feb. 22, 1856. (No. 459.)

This invention consists in the combination of the following metals for the manufacture of metallic alloy resembling silver. The alloy is composed of nickel 4 parts, copper 5 parts, tin, lead, zinc, iron, and antimony, each 1 part. These metals are placed in a crucible and melted. The alloy can be rolled into sheets by the ordinary means. It is nearly of the colour of silver, and possesses similar properties for working.

SCHISCHKAR, E. *Improvements in cleansing silk, hair, wool, yarn, and textile fabrics.* Dated Feb. 23, 1856. (No. 460.)

This invention comprises two parts, the first, consisting in steeping the substances or goods in naphtha, and then expressing such naphtha out of them again, and the other in subjecting them, as well as any other substances or goods which have a smell which it is desirous to remove, to the action of high pressure steam.

BOYD, J. E. *Improvements in scythes.* Dated Feb. 23, 1856. (No. 462.)

This invention consists in adjusting, contriving, bending, turning, cranking, and completing the heel or tang of the scythe before it leaves the manufacturer's hands to the various angles and shapes required to suit the convenience of persons using the same.

SPENCER, G. H. *Improvements in the manufacture of card surfaces employed in carding cotton and wool.* Dated Feb. 23, 1856. (No. 464.)

This invention consists in substituting for such card surfaces pins formed of steel, ground taper to points (like the points of needles) hardened and tempered and set in hard wood or metal backs, of sizes suitable to be readily applied by screws or otherwise, in place of the bent iron set in leather.

MESSENGER, T. G. *Improvements in boilers.* Dated Feb. 23, 1856. (No. 466.)

This invention consists in surrounding the fire with tubes which form water spaces, extending from front to back, and secured at each end to sockets cast on inner plates with sides and ends and flanges to which are secured front and back plates. A water space is thus formed between the inner and outer plates which communicate with the tubes. Water admitted at the lower tubes becomes heated, circulates through all the tubes and water spaces, and rises to an outlet at the upper part of the boiler. The bottom row of tubes serve the purpose of *fire bars.* The boiler is applicable to heating purposes; to convert it into a steam boiler, the patentee adds a steam chest, which communicates with the water spaces.

JONES, R. B. *Improvements in cooking apparatus.* Dated Feb. 23, 1856. (No. 467.)

This invention consists in a portable kitchen provided in a small space. It has a fire-place in front, fixed or made removeable. The sides consist of fixed or moveable hollow vessels or boilers, for meat, soup, water, &c. In these vessels others may be fitted, wherein stewing or straining may be carried on.

WARBURTON, J. *Improvements in machinery for combing wool, cotton, and other fibres.* Dated Feb. 23, 1856. (No. 469.)

Two combs are employed jointly and simultaneously to receive the tufts or feed of fibres, and the teeth of such two combs are together at the time of receiving the feed which is introduced transversely across the teeth. The two combs are then caused to separate, and the fibres are thus combed out, and parts of the fibres are retained in each of the combs. The protruding combed out ends of the fibres carried by the two receiving combs are brought to a third comb, and are passed into and amongst the teeth of it, by drawing rollers applied to each of the two receiving combs.

LOVERIDGE, H. *An improvement in feet, hip, and slipper baths, also in bases for shower baths and basins for washing and other purposes.* Dated Feb. 23, 1856. (No. 470.)

This invention consists in making feet, hip. and slipper baths, bases for shower baths and basins for washing, with the edges turned over interiorly, to hinder the water from slopping over.

SANGSTER, W. *An improvement in the manufacture of umbrellas and parasols.* Dated Feb. 23, 1856. (No. 471.)

The patentee has discovered that ordinary or straight down warp fabrics, wherein the warps simply loop into each other and proceed lengthwise of the fabrics, without traversing from selvage to selvage, may be employed with advantage for the covers of umbrellas and parasols, and his present improvement consists in so applying such fabrics.

SAMUELS, S. R. *Improvements in weaving fabrics.* Dated Feb. 23, 1856. (No. 472.)

Heretofore, when weaving several pieces of fabric face to face and parallel, and when using lace carriages as the shuttles to carry the weft threads or yarns, only comparatively narrow fabrics have been woven with convenience, by reason of the combs, bolts, or instruments which receive the carriages being beyond the selvages of the fabrics, and the width of the fabrics has been governed by the width of the carriages

employed. Now these improvements consist in giving movement to the combs, bolts, or instruments in which the carriages or shuttles move (at the back and front of the machine) in order that their ends may approach and recede from each other, and in order that such instruments may enter and leave the sheds opened between the several sets of warp threads, and so that when the bolts, combs, or instruments are in the shed they may have the carriages or shuttles moved from the front instruments to the back or from the back to the front by suitable pushers. The machine is arranged with several sets of warp according to the number of breadths of fabric to be woven at once.

BROOK, C., Jun., and J. HIRST. *An improvement in finishing yarns of wool or hair, and in the finishing of woven fabrics or piece goods.* Dated Feb. 23, 1856. (No. 473.)

This invention consists in causing such yarns, whilst distended and kept separate, to be subjected to the action of rotary beaters or burnishers, by which they will be polished on all sides; and also in subjecting woven fabrics of piece goods of cotton, linen, silk, hair, or other fibre, when in an extended state, to the action of rotary beaters or burnishers on either or both sides.

NORMANBY, L. *Improvements in the mode of constructing and fixing the rails of railways.* (A communication.) Dated Feb. 25, 1856. (No. 474.)

This invention consists in substituting longitudinal rolled iron sleepers for the wooden cross or longitudinal ones now in use, such sleepers being united from place to place by cross sleepers or transoms made also of suitably I-shaped rolled iron, the whole resting on the ballast.

HEYWOOD, B. J. *An improved holder for leads, slate, and other marking materials, applicable also as a case for other articles.* Dated Feb. 25, 1856. (No. 475.)

This invention relates — 1. To an arrangement of those holders which permit of the lead being pushed forward as it wears away. Down the centre of the holder stem is formed a hole to receive the lead, and also a sliding propeller (placed in the rear thereof) for pressing it forward. In the periphery of the holder is cut a helical groove (reaching to the central hole) to receive a stud attached to the propeller for actuating the same.

KERSEY, F. *An improvement in the manufacture of drain pipes.* Dated Feb. 25, 1856. (No. 476.)

This invention was described and illustrated at page 347, of No. 1731.

HAWTHORN, R. and W. *An improved arrangement of steam pump.* Dated Feb. 25, 1856. (No. 478.)

This invention relates to the arrangement of the vacuum and air vessels of pumps, in connexion with the several valves and working gear, also in the size and arrangement of the piston rod of the steam cylinder in connection with the pump plunger, together with the general disposition of the crank shaft with its bearings and connecting rod, all of which require engravings to illustrate them.

ILES, C. *Improvements in pointing hair pins, and in making up hair pins for sale.* Dated Feb. 25, 1856. (No. 479.)

Claims—1. Machinery in which the wire to be made into a hair pin is pointed at both ends, by being carried within the range of action of a pair of grinders, the wire having at the time rotation upon its axis. 2. The method of making up hair pins for sale, by sticking or inserting the hair pins in folds or elevations made in paper or other material.

CLAUS, C. F. *Improvements in metal ship building, applicable also to steam boilers, bridges, and other structures in which metal plates are used.* Dated Feb. 25, 1856. (No. 480.)

This invention consists in the production of extended surfaces of metal by uniting a number of bars or strips by interlacing or plaiting them together. To obtain greater firmness the patentee notches the bars or strips, and so arranges them that projecting parts fit into corresponding recesses, and round the lapping edges in order to gain a smooth face. He welds the several portions, or solders the whole together.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

WAYGOOD, R. *An improved portable laundry, or combined boiling, washing, mangling, and drying and ironing apparatus.* Dated Feb. 19, 1856. (No. 422.)

A table is fitted with rollers, and answers both as a mangle and an ironing board. Under this, and between the legs is fitted a metal semi-circular shaped vessel, and in it is suspended a dasher in which clothes to be washed are placed. The sides of this dasher consist of a wooden grating, and it is suspended from a rocking shaft. Under this vessel is a flue, and at one side is a small stove, which heats the water in the washing vessel and the irons for ironing. A drying chamber is connected with the stove.

GEDGE, J. *Improvements in syphons.* (A communication.) Dated Feb. 20, 1856. (No. 429.)

The inventor proposes to make a syphon with a reservoir above, and connected directly with, the longer limb of the syphon, the shorter or bent end forming its tubular connection just below the reservoir.

BROOMAN, R. A. Improvements in work-

ing railway switches and crossings, and certain indicating apparatus for preventing accidents on railways. (A communication.) Dated Feb. 20, 1856. (No. 430.)

This invention consists—1. In a method of working railway switches and crossings from the locomotive instead of from the road; and 2. In a telltale or clockwork index for indicating the passage of every train, and the time elapsed since its passage.

CLIBRAN, W. and J. *Improvements in and applicable to apparatus or mechanism for measuring and regulating the flow of gas, and in the mode of constructing parts thereof.* Dated Feb. 20, 1856. (No. 432.)

These improvements consist—1. In adapting gas regulators so that they may be made to serve the purpose of a stopcock. 2. In arranging a valve in one of the gas passages of gas regulators to answer the purpose of a stopcock. 3. In a gas-regulator apparatus to be worked by water, composed of a small case similar in form to a gasometer, arranged in a close vessel containing water in the same manner as a gasometer, but so that the pressure of the gas acts on the exterior of it, tending to sink it in the water. 4. In applying to and combining with gas meters a gas regulator worked by the water of the meter, or by water in connection with it. 5. In combining with a gas meter a gas regulator, which will also serve the purpose of the stop valve in wet meters, to shut off the gas when the water gets too low. 6. In a modification of the combination described under the fourth head of the improvements. 7. In the mode of constructing gas regulators of such small proportions that it will be found advantageous to apply them to regulate the supply of gas to single lights, such as the street lamps.

JOHNSON, J. H. *Improvements in steam-engines.* (A communication.) Dated Feb. 20, 1856. (No. 433.)

In one modification of this invention, two cylinders are placed endwise in the same axial line, and divided by a division plate, serving as the bottom to each cylinder. The cylinders are both double-acting, and are fitted each with a separate piston and rod of their own, passing through stuffing boxes at their extreme ends. The rods are connected to separate cross heads, which are again united by side rods. To these rods, at or near their centres, are jointed two connecting rods, which are united at their opposite ends by a cross head connected by a short rod to the crank.

SHERWOOD, H. *Improved means of treating the "spun waste" of wool, cotton, silk, flax, hemp, and other fibrous substances, so as to render it suitable for re-working.* Dated Feb. 20, 1856. (No. 437.)

Instead of forcibly drawing out the fibres when closely bound together, the inventor first cleanses the wastes by shaking them so as to remove any dust adhering to them, after which they are steeped in warm water with alkali or soap, washed in hot water, and dried by heat in a machine, in which they are submitted to a rapid motion, whereby the mass will be loosened, and the threads may then be drawn out after being previously moistened with a liquid composed of mucilage, linseed, or carrigheen moss, to which alkali may be added.

JOYEUX, L. A. *Improvements in obtaining motive power.* Dated Feb. 21, 1856. (No. 441.)

In the inventor's apparatus, steam is mixed with air suitably dilated, producing a combination of vapour and gas, which he brings to bear on the engine in the usual manner. When this has worked in the atmospheric machine, he sends them into another machine containing ether, for instance, which is thus evaporated without fuel, and of which the steam feeds the cylinder of the ether machine. The condensed water, which still retains heat, returns to the boiler, where it is evaporated.

DAWSON, W. *Improvements in machinery or apparatus for cutting paper or other materials.* Dated Feb. 21, 1856. (No. 443.)

The object of this invention is to produce a machine which shall cut paper, &c., both vertically and diagonally. It cannot be described without illustrations.

BENNETT, T., and W. P. DUGDALE. *Improvements in flyers used in spinning machinery.* Dated Feb. 21, 1856. (No. 444.)

The inventors attach a rod or spindle to the presser of the flyer, which extends in a parallel line with the tube arm, and nearly to the top thereof. At the top and bottom of the arm they fix brackets, with holes for the rod to turn in. On the top of the rod, and just under the top bracket, they fix a coil spring, and on the extreme top of the rod, above the top bracket, they fix a stud with teeth on part of it, forming a partial pinion. To the said bracket they also fix a weight turning on a pivot, the said weight having a sufficient number of teeth to work into the aforesaid pinion, thus forming a rack and pinion so that as the presser is moved by the pressure of the sliver it will turn the vertical spindle, which, acting upon the said weight by means of the rack, and adjusted by means of the spring, keeps it steady and balanced during its rapid revolution throughout the bobbin.

GEDGE, J. *Improvements in looms.* (A communication.) Dated Feb. 21, 1856. (No. 445.)

The inventor constructs an apparatus which cannot well be described without illustrations, employing one or more shuttles in a loom of ten repetitions.

ENTHOVEN, F. *An improved cover for gunpowder and other canisters and vessels.* (A communication.) Dated Feb. 21, 1856. (No. 446.)

A rim grooved on its outer circumference is fastened to the inside of the case, and formed with a vertical flange on its inner circumference. A lid is fitted truly into this inner circumference, and to this lid are connected hooked pins, and beneath these are fitted diverging arms, forming at the centre a collar screw-threaded on the inside, through which passes a short screw connected at bottom to the lid, and having a thumb-piece or handle at the top. On turning the screw in one direction the arms become engaged in the hooks, and the screw forces down the lid tightly; on turning it in the opposite direction, the arms cease to bear against the hooks, and the lid is loosened.

CHATWIN, T. T., and J. F. *Improvements in buttons.* Dated Feb. 21, 1856. (No. 449.)

This invention consists—1. In applying centres composed of discs of mother of pearl or other shell to the faces of buttons, partly covered with other material. 2. In using an elastic material, such as vulcanized caoutchouc, in the interior of buttons. 3. In making flexible shank buttons without the usual internal packing of paper. 4. In perforating the ordinary metal sewn-through buttons with perforations, in addition to those constituting the holes by which it is attached to the garment.

DIMENT, J. *Improvements in the manufacture of cements.* Dated Feb. 21, 1856. (No. 450.)

This invention consists in combining sulphate of zinc and lime with plaster of Paris (gypsum calcined). Also mixing, when desired, with such combination fatty and oily matters, magnesia, French chalk, or sand.

DENNET, C. F., and G. PAYS. *Improvements in cartouche and percussion-cap pouches.* Dated Feb. 21, 1856. (No. 451.)

This invention relates to an improved form of cap and cartouche-pouch combined, the main feature being the use of circular cells or receptacles for the cartridges.

GEDGE, J. *Improvements in preparing and combining metallic substances for producing colours, and in manufacturing the same.* (A communication.) Dated Feb. 23, 1856. (No. 461.)

The process of the inventor is based on the properties possessed by "blende," or native sulphuret of zinc, of transforming into oxide more or less pure, and, in its amorphous state, of discharging all its sulphur when submitted to proper heat in a reverberating furnace. The oxide remaining is coloured by other metallic oxides.

JONES, D. *Certain improvements in obtaining and applying motive power.* Dated Feb. 23, 1856. (No. 463.)

This invention consists in obtaining motive power by the action of air, water, or other fluids on each other by vacuum or pressure in certain apparatus which cannot be described without drawings.

WALSH, S., and J. H. BRIERLEY. *Colouring and graining skins of leather on one side, and japanning them on the other side.* Dated Feb. 23, 1856. (No. 465.)

This invention consists in colouring and graining skins or portions of skins on one side, and japanning them on the other, thus making one skin, or portion of one skin, answer the purpose to which two have hitherto been applied.

SCUDAMORE, J. *An improvement in domestic stoves or grates.* Dated Feb. 23, 1856. (No. 468.)

This invention consists in surrounding stoves and grates with a jacket at the sides and back, and in closing the jacket at the top to prevent communication with the chimney. The object is to cause air to circulate in the jacket, and to be dispersed over the apartment, in lieu of allowing the heat radiated from the back and sides being absorbed in the brickwork.

MURGATROYD, J. *Improvements in steam boilers.* Dated Feb. 25, 1856. (No. 477.)

This invention consists in the application of the system of staying the fire boxes of steam boliers, patented by the inventor in 1853, to those boilers which are constructed with a part overhanging the fire-grate. Also in the application to boilers having a part overhanging the fire-grate of tubes or flues for the passage of the products of combustion, which are brought back through other tubes or flues in the boiler, and in so constructing boilers that the ends af the upper part may be made partly cylindrical, thereby superseding the necessity of stays. The invention also consists in constructing steam boilers of circular or partly circular compartments united together.

MARZOLO, J. *An impressible mechanism, reproductive of movements, and applicable to weaving and other looms, and for industrial purposes.* Dated Feb. 25, 1856. (No. 483.)

For producing a design to be woven, the inventor uses a cylinder with spiral or circular grooves, into which he fixes small blades or pins moving on their centres within the grooves, and projecting from the surface of the cylinder. He has also a keyboard similar to a piano, each key being numbered. These keys act upon levers, numbered to correspond. The end of each lever has a projecting stud which presses against the blades or pins, according to the design required, and makes an indent.

JOULE, J. P. *Certain improvements in steam engines.* Dated Feb. 26, 1856. (No. 486.)

These improvements relate to apparatus for condensing steam. The steam, after performing its expansive action on the piston, is conducted through pipes, surrounded with water or other refrigerating substance, as originally employed by Watt. The water is made to pass in a contrary direction to the steam, as in "Liebig's condenser." A pump draws the air and water out of the condensing pipes, and forces the water only into the boiler. The air is got rid of by causing the condensed water and air, in their way towards the boiler, to pass a part of the conveying tube, or a receptacle in connection therewith, higher than the adjacent part nearer the boiler. This receptacle may be conveniently placed immediately over the clack of the pump.

COATS, G. *Improvements in partitions or "brattices" for coal mines and other underground works.* Dated Feb. 26, 1856. (No. 488.)

This invention consists in the use of sheet iron or other thin metal, instead of wood, canvas, &c., in the formation of the "brattices" or air divisions in mines.

PFNOR, F. R. *Certain improvements in looms for weaving.* (A communication.) Dated Feb. 26, 1856. (No. 489.)

The inventor describes a loom which may be driven by a steam engine, and which is adapted for weaving the various fabrics which may be produced by the hand loom, the jacquard loom, and the electric loom.

PROVISIONAL PROTECTIONS.

Dated August 26, 1856.

1992. Alfred Vincent Newton, Chancery-lane, Middlesex, mechanical draughtsman. An improvement in breech-loading cannons and other ordnance. A communication.

Dated October 1, 1856.

2292. George Flint, of Skinner-street, Bishopsgate Without, London, engineer, Thomas Wood, of Tachbrook-street, Pimlico, Middlesex, and Edward Wood, of Tachbrook-street, aforesaid. An improved punching press or machine, adapted to the purposes of stamping, coining, slotting, and embossing, and for cutting metal and other substances.

2294. John Holman, of the Western Clubs, Topsham. Improvements in ships' rudders.

2296. Henry Naylor, of Bacup, warper, and James Crabtree, of Rochdale, machine maker, Lancaster. Improvements in and applicable to machines, commonly known as "warping mills."

2298. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Certain improvements in sewing machinery. A communication.

2300. Charles Durand Gardissal, of Bedford-street, Strand, London. Improvements in stoves and apparatus for heating or warming greenhouses, which may also be used for other warming or heating purposes. A communication.

2302. David Jones, of Greenhill-villa, Raglan, Monmouth, civil engineer. Certain improvements in obtaining and applying motive power.

Dated October 2, 1856.

2306. James Whitehead, of Dukinfield, Chester, grocer. Certain improvements in machinery or apparatus for preparing and spinning cotton and other fibrous substances.

2308. Victor Renault, of Bordeaux, France, practical engineer. Improvements in regulating and directing the steam escaping from the cylinders of locomotive engines.

2310. Henry John Distin, of Cranbourne-street, Leicester-square, Middlesex, musical instrument manufacturer. Improvements in the means of regulating the tone of kettle drums. A communication.

Dated October 3, 1856.

2314. John Hopkins, of Lower Oxford-street, Whitechapel, Middlesex, builder. Improvements in the construction of furnaces.

2318. Lemuel Wellman Wright, of Sydenham, Kent, engineer. Improvements in gas meters.

2320. David Ogilvy Boyd, of Welbeck-street, Middlesex. Improvements in constructing and arranging smoke and air flues.

2322. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. An improved lathe or tool suitable for turning, drilling, boring, planing, and smoothening, also for grooving, morticing, and slotting, parts of which tool may be applied to lathes generally. A communication from Monsieur Fleury.

2324. Robert Haslam, weaver, and James Haslam, timber dealer, of Preston, Lancaster. Improvements in looms for weaving.

2326. Charles Durand Gardissal, of Bedford-street, Strand, London. Improvements in the manufacture of cement. A communication.

Dated October 4, 1856.

2328. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improvements in supplying steam boilers with water. A communication.

2330. Maria Farina, of Hanway-street, Oxford-street, Middlesex. An improved tooth powder. A communication.

Dated October 6, 1856.

2332. John Silvester, of Woolwich, Kent, machinist. Improvements in the application of steam or air in the production of motive power.

2334. Herbert Mackworth, of Clifton, Gloucester. Improvements in the separation and treatment of mineral substances, and in coking, and in apparatus connected therewith.

2336. Victor Avril, of Paris, France, engineer. Improvements in the manufacture of iron and steel.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

2382. Timothy Gilbert, of Massachusetts, U.S. An improved piano-forte action or string sounding mechanism. A communication from D. H. Shirley, U.S. Dated October 10th, 1856.

NOTICE OF EMENDATION.

1928. *Mechanics' Magazine*, page 238, No. 1724, *for* J. Stopperton, *read* J. Stopporton.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," October 21st, 1856.*)

1370. B. Smith and W. Kalthoff. Improvements in economizing fuel in the locomotive and other steam engines.

1386. J. H. Johnson. Improvements in the manufacture of safety-paper. A communication.

1415. E. Lindner. Improvements in breech-loading fire-arms.

1420. J. B. Mannix. A method of applying locomotive power to the working of inclines. A communication.

1425. H. Holland. Improvements in the manufacture of umbrellas and parasols.

1426. J. Sadler, J. Green, and T. Davis. Improvements in the manufacture of hinges.

1438. C. Clifford. Improvements in boat-lashings and in blocks and apparatus used for raising and lowering boats and other articles.

1455. J. Hague. Improvements in machinery or apparatus for manufacturing bands or cords for driving machinery and other purposes.

1489. C. D. Gardissal. Improvements in engraving glass and crystals. A communication.

1515. J. H. Johnson. Improvements in the production of carbonate of barytes. A communication.

1525. W. McAdam. Improvements in the manufacture of articles of clay and such like plastic substances. Partly a communication.

1526. C. A. Messager-Abit. Certain improvements in the treatments of fibrous substances.

1598. H. B. Condy. Improvements in defecating or purifying acetic acid and other solutions, also in disinfecting rooms and other places, and in preserving wood.

1608. A. V. Newton. Improvements in repeating fire-arms. A communication.

1831. T. Green. Improvements in mowing-machinery.

1861. A. T. N. Goll. An improved button.

2065. H. E. C. Monckton and W. Clark. Improvements in machinery or apparatus for tilling or cultivating the soil.

2072. J. Johnston. Improvements in photographic plates. A communication.

2085. P. R. Hodge. Improvements in grinding wheat and other farinaceous grains, and in the treatment of the products therefrom.

2120. W. H. Forster. An improved fastening for articles of jewellery, brooches, or dress ornaments.

2134. J. T. Pitman. Improvements in repeating fire-arms. A communication.

2223. J. Morrison. A new or improved penholder.

2235. J. Cottrill. Improvements in machinery to supersede hand labour in the operation of filing.

2281. H. Jenkins. Improvements in the manufacture of buckles and other dress-fasteners.

2294. J. Holman. Improvements in ships' rudders.

2298. A. V. Newton. Improvements in sewing-machinery. A communication.

2382. T. Gilbert. An improved pianoforte action or string sounding mechanism. A communication.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1853.

2388. George Frederick Chantrell.
2399. George Louis Stocks.
2435. Jean François Felix Challeton.
2436. Pierre Marie Fouque, Louis Réné Hébert, and Vincent Etienne Doret le Marneur.
2455. Thomas Summerfield.

LIST OF SEALED PATENTS.

Sealed October 17, 1856.

1856.

928. Uriah Scott.
930. Thomas Walker.
932. Julius Jeffreys.
938. Edmund Hunt.
939. Charles Frederick Stansbury.
940. William Adkins.
960. Alfred Vincent Newton.
964. David Lloyd.
989. Frank William Blacket.
993. James Hardacre.
1017. Thomas Webster Rammell.
1049. Robert Tolmie Campbell.
1059. Alfred Chadburn.
1063. John Wright.
1081. James Gray Lawrie.
1120. William Edward Newton.
1182. George Clark.
1647. William Bridges Adams.
2033. Lazarus Simon Magnus.

Sealed October 21, 1856.

955. William James Cantelo.
967. William George Armstrong.
970. George Forster.
972. James Garnett.
974. Thomas Squire and Charles Frederick Claus.
975. John Shae Perring.
1014. James Stead Crosland.
1019. William Pilling.
1021. John Smith and William Craven.
1028. Nathan Defries and George Henry Bachhoffner.
1029. Henry Mapple.
1036. Nathaniel Smith.
1074. Jean Périnaud.
1075. Robert Royds.
1119. William Edward Newton.
1128. William Edward Newton.
1196. Alfred Vincent Newton.
1284. John Harris Heal.
1335. Richard Archibald Brooman.
1358. William Edward Wiley.
1616. William Bridges Adams.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
Sept. 26	3880	T. F. Hale	Bristol	Pillar-pump.
,,	3881	J. Gillott	Birmingham	Metallic pen.
29	3882	W. G. Speed	Shepton Mallet	Cheese-vat.
Oct. 6	3883	H. J. and D. Nicoll	Regent-street	Railway-rug.
7	3884	Messrs. Leake & Dodds	Wigmore-street	Bonnet-support.
8	3885	H. Craigie	Edinburgh	Gas apparatus.
10	3886	T. B. Bailey	Coventry	Medal-fastener.
,,	3887	T. Greaves	Birmingham	Button-fastener.
,,	3888	H. Rawson	Leicester	Smoke-consumer.
11	3889	C. H. Protere	Duke-street	Railway guard-belt.
14	3890	R. Timmins & Sons	Birmingham	Paring-machine.
17	3891	T. Pemberton & Sons..	Birmingham	Door-spring.
,,	3892	Smith & England	Stourbridge	Corn-shovel.
22	3893	T. L. Henly	Calne, Wilts	Chimney-top.

PROVISIONAL REGISTRATIONS.

Oct. 1	800	W. Nightingale	Willow-row, St. Luke's	Clarinet.
3	801	G. Flint	Skinner-street	Ratchet-brace.
,,	802	G. Flint	Skinner-street	Flooring-cramp.
8	803	T. Morris	Regent-street	Horticultural cover.
14	804	A. Albités	Birmingham	Candle-support.
21	805	E. T. Ferrers	Weston-super-Mare	Camp-stool.

NOTICE TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.—*D. Mushet.* Your letter shall appear in our next.

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LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

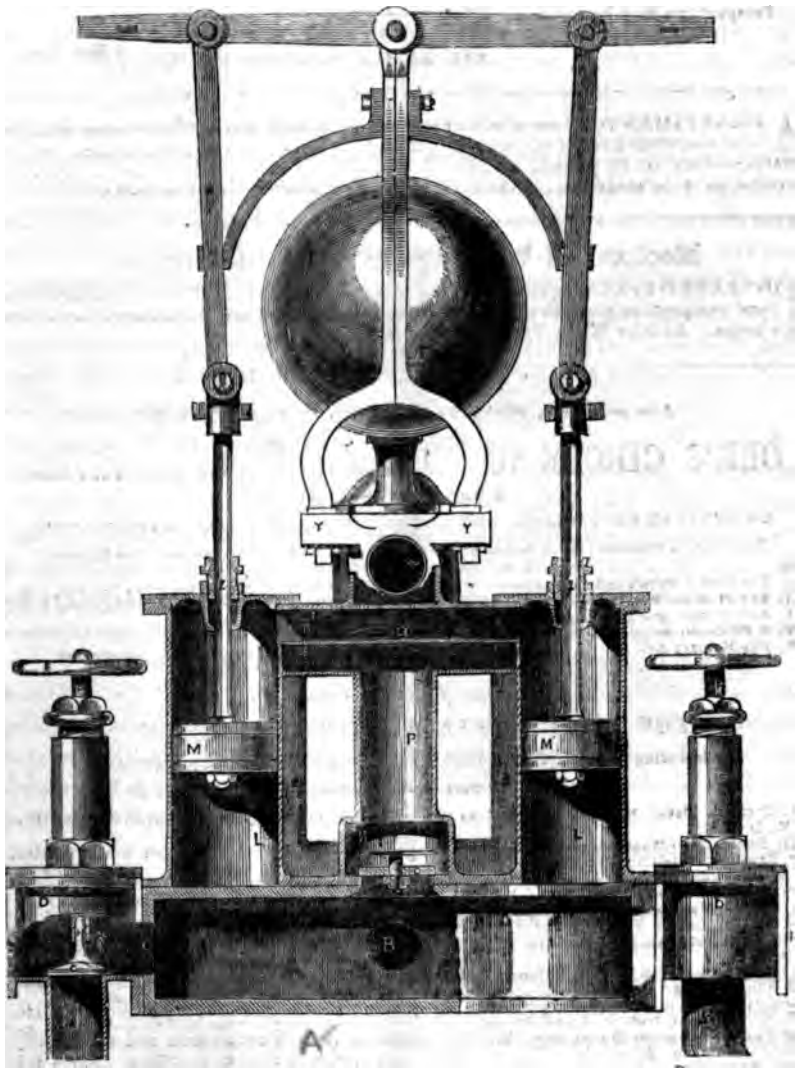
Mechanics' Magazine.

No. 1734.] SATURDAY, NOVEMBER 1, 1856. [PRICE 3D.

Edited by R. A. Brooman, 166, Fleet-street.

HOW'S PATENT PUMP AND FIRE ENGINE.

Fig. 1.



HOW'S PATENT PUMP AND FIRE ENGINE.

Mr. A. Peddie How, engineer, of London, has just patented an improved arrangement of pumps well adapted for marine purposes.

Fig. 1, of the accompanying engravings, represents a sectional elevation of pumps. Fig. 2, represents a transverse section of ditto. A is a cast iron or brass suction chamber, serving also as foundation for the pumps. The chamber A, has four apertures, B, B, C, C. The two latter, C, C, join valve cocks D, D, which are so constructed as to act as stop valves. The wheels E, E, are used for lowering the spindles F, F, to the valves C, *c*; the spindles F, F, having recesses, H, cast in them, which allow the stem of the valves to rise when the wheels E, E, are used for screwing the spindles up, or effectually closing the valves when the spindles are screwed down. The aforesaid cocks have two branches, I and K; the one, I, to be used as suction for fire engine; the other, K, for suction from the sea or any other part it may be necessary to draw water from. L, L, are the pump chambers fitted with pistons. M, M, N, is the under suction chamber fitted with an India-rubber valve, O, forming the communication between the suction chamber, A, and the pumps. L, L, P, shows the passage for the water from the suction chamber, A, to the upper suction valves, Q, where it flows through the passages, R, R', to the top of the pistons. M, M, S, S, are also water passages from the suction chamber to the underside of the pump pistons. M, M, T, T, are the delivering valves, having recesses, U, U, in them, allowing the stems of the suction valves, Q, Q, to rise in them, thus acting as guides. V is the delivery valve box, having branches, W, on it, to which may be attached the delivery pipes or fire hose, as may be required. The cap, X, of the valve box, V, is also fitted with a recess in which the stem of the delivering valve, T, rises, thus acting as a guide for both the delivering and suction valves. Y, Y, are lugs cast on the delivery valve box, for taking the standard which carries the beam for working the pumps; this beam being connected by side rods to the piston rods, Z, Z. Handles, with sockets that may be shipped or unshipped from the aforesaid beam, as the work requires more or less power, being provided for that purpose.

The action of the pump is as follows: Either of the openings, B, B, or C, C, of the suction chamber being opened and the pump set to work, suppose that one of the pistons, M, is going down, and the other going up, the water flows through the India-rubber valve, O, into the passage P, raises the upper suction valve, Q, thence goes through the passage R, to the top of the pump piston M; at the same time the pump chamber under the piston being full of water, delivery takes place through the passage, R, to the top of the upper suction valve, Q, raises the delivering valve, T, and is forced out of one of the delivery branches, W. At the same time the other pump piston going up, the pump chamber having filled on the top of piston by the up stroke of the other one, the delivery takes place through the passage R, above the upper suction valve Q. The suction taking place under the piston, through the valve O, thence proceeding through the passage P, lifting the upper suction valve, Q, and passing through the passage S. The operation is thus continuous and the delivery *takes place* twice at each up, and the same at each down stroke.

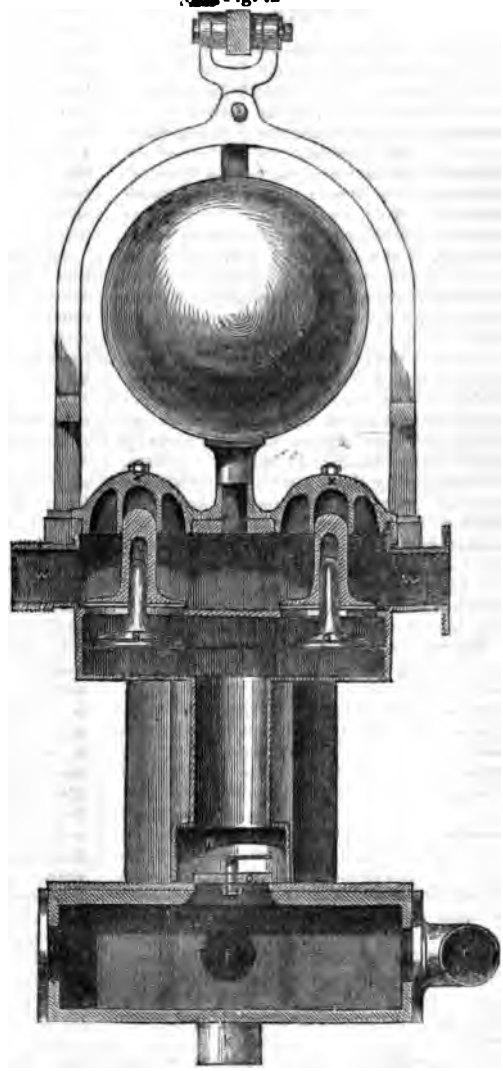
The advantages claimed for the patent pump are, First. The mechanical arrangement of the pumps, valves, and passages, each pump being double acting, by the disposition of the passages as described above, thus having two double acting pumps occupying but little more room than a single acting one of the ordinary construction.

Secondly. The simplicity of construction and detail, the suction chamber forming the foundation being cast in one piece either of brass or cast iron. The pump chambers suction and delivery passages being also one casting. The facility with which the valves may be examined, only requiring the cap to be unscrewed from the valve box, the valves being under immediate inspection, and they are placed at the top.

Thirdly. The durability, and at the same time the simplicity of this pump, are shown in the fact of only five valves being required, thereby causing a great saving in weight of material and cost of workmanship. For vessels it is invaluable, on account of the great power it possesses for throwing a large volume of water with great rapidity, in case of fire, and the small space it occupies.

Fourthly. The advantages are just as great when applied to land fire engines, for which it is equally well adapted.

Fig. 2



NOVEL MECHANICAL OPERATION AT CHERBOURG.

An interesting mechanical operation has been lately performed at the Imperial Dockyard, at Cherbourg, in the hauling-up of a line-of-battle ship, under a building shed, upon an ordinary launching cradle and way. It was performed with the assistance of six capstans manned by about 700 men, and occupied nearly seven hours. The credit of this extraordinary and successful operation is due to M. Corrard, the superintendent engineer of the dockyard.

"CORNISH ENGINES AND ENGINEERS."

With many engineers the word "Cornwall" is synonymous with single-acting condensing steam engines, using high-pressure steam, and carrying out the system of expansion to an extent unheard of in any other engines. The older engineer readers of the *Mechanics' Magazine* must have a vivid recollection of the many papers on the Cornish pumping engine, and its extraordinary performances, published and discussed in its columns fifteen to twenty years ago. A very great economy of fuel relatively to that of other engines then working was a point on which all agreed; but on the causes by which it was accomplished, scarcely two engineers were of the same opinion. Slow firing, carefully clothing boilers and pipes, high-pressure steam, great expansion, more complete exhaustion, impact of the steam, and many other causes were successively offered in explanation by very able writers, without solving the mystery. Whether the Cornwall engineers themselves knew the cause of the superior economy of fuel is a matter of doubt; for the performances of many of the new engines were so irregular and capricious as to induce a negative supposition. A few remarks on the subject may not be amiss to your readers.

Having finished with engineering, whether in designing or in directing the manufacture and erection of steam engines, in all parts of which he has had a trifle of experience, the writer lately ventured on a pedestrian tour in Cornwall, and, approaching the large engines of the central and western mining district, with a feeling somewhat akin to admiration and awe, determined, if possible, to gather one more wrinkle before quitting all things mundane. With a walking-stick graduated into feet and inches, a pencil and few blank cards for taking notes without exciting suspicion, he directed his steps towards St. Day, near which town there was erecting a pumping engine of the largest class—90 inch cylinder; and, within easy distance, another large engine—an 80-inch, was also in course of erection, but by other parties.

Commencing with the larger engine, the boilers were of a description not seen out of Cornwall, and at a minority only of the mines within it, as subsequent investigation showed. They went under the designation of "canister boilers," having a length of 6 or 7 feet one end, 12 or 18 inches larger than the other part of the boiler, and furnished with a tube of similarly-increased diameter at this place, in which was situate the fire. The object appeared to be the ob*aining a greater* width of fire-grate. This could be equally well met by lengthening the grate from 4 or 5 feet, its present dimensions, to 6 or 7 feet, and thereby avoiding the comparatively difficult junction of tubes and shells of dissimilar diameters. By this enlargement of the fireplace and one end of the shell, leaving the remainder of the boiler of comparatively small size, and containing a large tube, the steam room, relatively to the area of fire-grate and flue-surface, is reduced to perfectly microcosmic dimensions—on a par, in fact, with the boilers of many locomotive engines.

After advancing this step—in what direction I will not stop to inquire—a new light seems to break on the engineer; the steam room in the boiler is found disproportionately small for the size of the engine. To increase it, the small steam pipe of each boiler is connected with a cylindrical tube made of boiler plate, which acts as a common reservoir for all the boilers. The dimensions of this reservoir vary with different engineers; but in this particular engine appeared to be 30 inches diameter and 9 feet length for each boiler of the set.

Now, while I do not wish to too severely criticise every innovation, I observe in practical engineering, this placing of a tiny reservoir on a large boiler with a high water level, the connection between the two being a small steam pipe, seemed to me to display very little of that profound practical acquaintance with boilers and steam which many of our first engineers imagine exists in Cornwall. If dry steam (and with such only can great economy of fuel be obtained) is the desideratum, there must be some ratio observed between the size of the engine, the area of fire-grate and heating surface, and the volume of water-surface exposed to, and capacity of steam room. It is also necessary that the steam pipe, if small, should not approach the level of the water too closely, or the violent indraught at the spot will carry upwards a quantity of the hot water. The Cornwall engineers ignore all relations of this kind. Fireplaces have been enlarged, surface of water and steam-room greatly reduced, and the small steam pipe brought nearer the surface of the water.

I have seen engineers, when, through error of construction, the steam-room has been found too small, append a reservoir or other vessel to remedy the defect; but in the case of the engine under consideration (and of others also) the remedial appliance appears to have been copied into new engines as something meritorious. Yet a very brief acquaintance with the first rules of arithmetic would have sufficed to show that the metal in the cylindrical tube, applied to the boiler shells, would have augmented the steam-room to a greater extent. A short

steam dome, 20 or 30 inches diameter, on each boiler, prevents the influx of water to the engine, and is now nearly always placed on boilers by the first makers. Granting, however, for a moment, that small steam room and a reservoir requiring careful clothing, is an improvement, I proceed towards the engine.

On meeting with the engine-house wall, the wrought tube is reduced from 30 to 20 inches, the bore of the connecting cast-iron steam pipe. The steam pipe is still further reduced until, at the stop-valve, it measures some 13 inches bore. Deducting the area occupied by cross bar, spill, &c., of the valve and seating, the area of the steam valve will be to that of the steam cylinder as 1 to 60. Is this proportion a good one? A steam port 1-60th the area of the cylinder, for an engine working to a long stroke! Calculating the initial velocity at 700 feet per minute, the steam must travel 42,000 feet, or 8 miles a minute, to keep pace with the piston.

Can there be other than much wire-drawing with such proportions? On looking at the indicator-diagrams taken from the top of the steam cylinder, the utter inability of the steam to follow the piston in its descent is manifest in every instance which has come under my notice.

In proportioning the size of the valves, the Cornwall engineers seem to follow one rule—that of copying, without any regard to the correctness of the model they follow. It is impossible they can have the faintest glimmering of correct proportions, when the same contracted steam valves are placed in engines of all descriptions made in the county. Of two high pressure crank engines designed and made by one of the largest firms, the steam valves have an area of only one-fiftieth of the steam cylinder. The ill consequences of this proportion are seen in the slow pace at which the engines can be driven. Situated where coal is comparatively cheap, 220 to 240 feet per minute is the extreme velocity attainable, with whatever pressure the boilers may be loaded; while other engines alongside, with steam valves and pipes of three times the area, are driven twice this speed, with a consumption of fuel one third lower in proportion to the power given off.

Passing onward, I arrive at the equilibrium and exhaust valves, and here is seen one of the peculiarities of Cornwall engineering; the equilibrium is nearly twice, and the exhaust valve three times the area of the steam valve. Each of these valves is open five or six times the period which the steam valve is allowed to be open, yet they are made so much larger. Why the exhaust valve of an engine should be made three times the area of the steam valve is a question which some one of the learned engineers of Cornwall may be able to explain, but which altogether surpasses my ideas on the motion of elastic fluids.

Mounting to the beam (or as the local engineers term it "bob") the spectator is favoured with a specimen of the founders' craft, in which abundance of metal is seen disposed in anything but a scientific manner. Symmetry is quite beside the question in their opinion. The moulder seems to have wrought the mould for this notable piece, without the assistance of any pattern, merely using his spade to dig the excavation and a few fathoms of twine to guide him in straightening the edges. These simple instruments would not be so much amiss, but the metal is disposed alternately in masses and thin plates, thus setting at defiance the well known laws that the rapidity with which iron contracts is inversely as the thickness. On the specimens destined for exportation to other districts, the moulding is better done, but no greater attention seems paid to the disposition of the metal.

Transcribed to my note book are numerous remarks and sketches relating to other prominent features of this engine, and of the other new engine alluded to, but I am extending this to too great a length for a single communication, and must defer their consideration for a second. It may suffice to say, that amongst other engines, I visited the 100-inch pumping engine near Helstone, which had been extolled as a splendid specimen of engineering; but when analysed, I failed to detect in it any indications whatever of genuine engineering talent. Throughout, it was a mere copy (with those questionable alterations I have mentioned) of other engines in the same neighbourhood, some of which had been at work for periods of forty years and upwards.

To show that I have a sound basis for these strictures, which fall short of the reality, and am not actuated by a spirit of fault-finding, I would mention what is well known to the majority of your readers, namely, that periodical reports of the duty or performance of the best of the Cornwall pumping engines are issued to the public, from whence may be gleaned the actual state of engineering at different periods within the last half century. A spirit of emulation among the Cornwall engineers of a former period, as to whose construction of engine worked most economically in regard to fuel, led to the issuing of these reports. Of the manner in which the accounts are kept, I need not speak; it is sufficient to remark that the measure or unit of comparative efficiency is the number of million pounds lifted one foot high by the consumption of

a bushel of coals; commonly, this is designated the "duty" of that particular engine. Lately, the duty of a number of the engines in the eastern division of the county has been calculated on the 112 lbs., but for comparison, I will reduce them to the old Cornwall bushel standard.

With this unexceptionable standard then, we will see what is the present state of engineering in Cornwall compared with former periods. I will take at random the month of November, 1837, the six months ending December, 1848, and the month of July last for comparison, and the account stands thus:—

	Millions.
1837. The mean duty of 23 of the best engines was	60·6
1848. The mean duty of 23 of the best engines in the eastern division was	53·1
„ In the western division the mean of 25 was	52·0
1856. The mean duty of 24 of the best engines in the eastern division was	55·8
„ In the western division the mean of 23 was	47·0
1837. Six of the best engines averaged	75·7
1848. Six of the best eastern engines	71·5
„ Six of the best western do	64·8
1856. Six of the best eastern do	66·3

These figures require no comment: They speak volumes. In twenty years the duty has fallen from 60·6 to 47 millions. Into what hands the unrivalled inventions of Hornblower, Woolf, and Trevethick have fallen, that we thus see the duty of their engines ruthlessly degraded with astounding rapidity! What incomparable improvements in construction; what extraordinary advances towards comprehending the properties of steam have the present race of engineers not displayed! While other engineers have spared no efforts to place the performance of their engines on the highest level, the Cornwall engineers in the face of all advances of knowledge on the subject, and with tools of construction immeasurably superior to those of their predecessors, have succeeded, by dint of immense labour and innumerable *improvements*, in lowering the efficiency of their engines nearly 25 per cent.!

Objection may be taken that all the engines do not appear in the reports; but this argument, if worth anything, is applicable to each of the three periods taken. The *élite* of the engines do appear, for no sane person is going to believe that the worst are selected for parading before the public and engineers generally. The number of engines now at work is probably more than twice the number at work in 1837, and the selection of only 23 best engines of a so much larger number, makes the return for the present year appear more favourable than they should be in common fairness.

A word as to the probable cause of this retrogression. The practice formerly prevailing in Cornwall was to employ an engineer to design the engine and occasionally inspect its construction and erection, for which he was paid the established rate of one guinea for each inch diameter of cylinder. Thus, for an engine of 80-inch cylinder the engineer's remuneration was 84*l.* After its erection he was paid 1*l.* per month to occasionally look over its action. This was a very fair system, for as the engineer's reputation rose and fell with the performances of his engines, he had a very great inducement to design such an engine as would attain the greatest duty. Lately a different system has largely prevailed, and the county contains scarcely a single *engineer*, in the strict acceptation of the term. The modern "engineer" is a dealer in old metal, or a founder having a heavy stock of second-hand castings on hand, ready to contract for and cobble up an engine of any size. No longer deriving any prestige from engines so much inferior in their duty to those made twenty or thirty years ago, he looks to remuneration from the profits of jobbing contracts of every description, utterly regardless of the waste of fuel entailed on the proprietors.

The word "engineer" is made to cover a multitude of dissimilar professions. Formerly an engineer was an individual of great mental abilities, who designed complicated machines for special purposes, and directed the erection of difficult works. Now every contractor is a "civil engineer"; every founder dubs himself an "engineer"; dealers in second-hand machinery, &c., are "engineers"; metal brokers are "engineers"; turners and whitesmiths are all "engineers." The catalogue of misnomers could be extended to the last page of this number of the magazine, but these specimens are enough. Individuals who never in their whole lives investigated the action of a steam engine, inquired into the principles involved in the construction of machinery, or propounded a single original idea, consider themselves engineers. In my humble opinion there is as much difference between these *soi-disant* engineers and the *bonâ fide* article as between a builder and an architect, a druggist and a physician. Their

very assumption of the professional title of engineer shows a blunted state of the perceptive faculties, incompatible with the possession of engineering talent. The dealer in second-hand engines and old metal ought to haul down his sign-board, and substitute "Dealer in marine stores" as more correctly designating his occupation. I have a suspicion that these gentlemen are amenable to the same Act of Parliament as the rag-and-bone merchants, and will look up my law-notes for information on the point.

A persistence in this vicious system of constructing engines has entailed on Cornish mining a heavy incubus, more injurious than any fiscal enactment in existence. Estimating that there are 300 pumping engines in the district, averaging 1,000 tons of coal annually each, at 16*s.* a ton delivered, the degradation of duty from the standard of 1837 results in an annual waste of nearly 70,000 tons of coal, costing £55,000.

Finally. What have the present engineers done towards improving the Cornish pumping engines?

COSMOPOLITAN.

October 20, 1856.

DECIMAL MEASURES AND WEIGHTS.

THE FRENCH METRICAL SYSTEM.

(*Concluded from page* 394.)

Half-a-dozen government regulations have not sufficed to give the French a rational system as yet. Twenty years after the introduction of the metre, a government regulation established a mechanic's rule of one-third of a metre long, divided into 12 inches, and each inch into 12 lines. Curious decimals these. Surely, when giving the mechanics a bran-new rule, they might have decimally divided it. Nine months afterwards, another regulation establishes measures of $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{32}$, $\frac{1}{64}$, of a hectolitre. The kilogramme divided into 2 livres, the livre into 16 ounces, the ounce into 8 gros, and the gros into 72 grains, makes a very pretty medley indeed. Adopt the French system of measures and weights? Which system? As a stepping-stone to general uniformity amongst the nations of Europe, adopt the metrical system, cries one. But how, if the French abandon it themselves immediately afterwards, and make another? Systems are as easily made as constitutions, and more easily abandoned. They abandoned it so far as the people were concerned; and if a system be not for the people, whom is it for? If not to be used at the counter, in the warehouse, or workshop, where is it to be used? What is the utility of it?

Look at the French corn market. The following is from the *Express*, 30th September, 1856. "In the Paris corn market, during last week, a considerable amount of business was transacted, and prices in general slightly advanced, the four marks being held at 91 fr. 50 c., and 92 fr. the 157 kilogrammes. The reserve at the Halle is at present 11,000 metrical quintals. Wheat advanced on Wednesday about 1 fr. the hectolitre and a half."

In what other country could you find such an absurdity as quoting corn by the measure and a half? To say nothing of that beautiful decimal number 157 kilogrammes. Will the advocates of French measures tell us distinctly what they would have us adopt? A very modest proposition was made at the late Brussels Congress. It was gravely proposed that England should adopt the French measure of a metrical quintal for shipping tonnage! The whole of the shipping of the Anglo-Saxon family, to be considered of no account compared to the handful of French fishing smacks! All the English foxes must cut off their tails, because the French renard has lost his *queue*. How much easier would it be for the French to adopt our *ton*nage for the sake of uniformity. One little item among their confused jumble could not make much difference. We do not measure by the ton and half, nor by 157 cwts. Perhaps we shall next be called upon to adopt the centesimal division of the quadrant,—make waste paper of all our maps, charts, and astronomical observations. The metre without the centesimal quadrant would be still worse, for the degree would contain 111,111⅛ metres; nearly as bad as the 157 kils.

But philosophizing was not over when the metre was complete. The pressure of the atmosphere varies; so the *savans* determined to fix the standard of weight in vacuo. The maximum density of water is a fixed point, so the standard of weight was fixed at 4° centi. But not enough philosophy yet; so they adopted the heaviest of all known bodies for the standard of weight.* And what is the consequence? A litre of water will weigh a platinum kilogramme, in vacuo, at the temperature 4° centi. What will it weigh under the ordinary pressure and temperature of the atmosphere? To answer, you must be read up in the science of heat, and hydrostatics,

* L'étalon prototype en platine, déposé aux Archives le 4 Messidor, an vii., donne, dans le vide, le poids legal du kilogramme.—Annuaire pour l'an 1844 du Bureau des Longitudes.

and handy in your arithmetic. Had they called in some travelling tinker, he would have recommended that they should ascertain, as near as they could, the probable average temperature, and pressure of the atmosphere, or elevation above the sea, where the weights were to be used; and to take the standard of weight under these circumstances, and to use such a material, for the standard weight, as should be as near as possible of the same specific gravity as the weights likely to be used. A French engineer has the volume of the load, on the pump, of his pumping engine, but he must put up with an approximation to the weight, to gratify the whim of a philosopher, who cannot bend to such paltry things as trade and commerce.

A great philosopher is justly the glory of his country, but only as a philosopher. He ceases to be great when he dabbles in mechanical manipulation, or without consulting men engaged in trade and commerce, undertakes to prescribe laws that affect their most vital interests.

The man of science is well qualified to give a sound decision *when all the circumstances are before him;* but, in an affair of measures and weights, it is only the practical man that can see all the circumstances. The French *savans* never dreamed of such a thing as a convenient mechanic's rule or farmer's bushel. Their fault is, not calling to their aid such persons as would have to make the greatest use of the measures and weights. The consequence has been more than sixty years of vexation and mortification. The only good they have done has been to give a warning to other countries, though some have been so foolish as not to be warned. When our own Government wanted a standard, instead of calling to their aid a Whitworth, or other clever mechanic, they gave the job to a clergyman, who muddled away his time, year after year, in an underground cellar, and at last produced nothing worthy the name of standard. England has yet no standard of measure, and therefore none of weight worthy the name.

The boundaries of a standard should be surfaces, and touch should be the test. The British so-called standard has for its boundaries certain marks on a surface, and you must guess the centre of the marks. Let the marks be made as fine as possible, they will still have breadth, of which you must guess the half; but you cannot take half the thickness of a surface. French blacksmiths, 300 years ago, had better ideas of the requirements of a standard than modern English philosophers. La Hire, in 1714, aking of the aulne of the wholesale ers (grossiers) which was made in 1554, "*It is easy* to measure it, for this standard is a thick iron rule, with two pieces of iron fastened perpendicularly at the ends, between which the rule may be applied that we would measure."

Any reasonable man would think that enough learning had been brought to bear upon the metrical system by this time; but no, it is as full of philosophy as it will hold, it is true, but it is not fully gorged, so it is handed over to the literary man, to try his hand upon it. It must not only be philosophical but classical, because it is to be the perfection of human wisdom, to be adopted by all other nations along with the philosophical calendar and political epoch.

Common sense appears to have been much more common with our ancestors than with us. When they had occasion to coin words, to represent simple elementary ideas, they generally chose very simple monosyllables. Inch, foot, mile, dog, ox, mouse, cat, ounce, pound, ton, &c. Now-a-days if we want a new word, it must be a good mouthful; three syllables is a shabby affair, and shows poverty of scholarship. But by far the most important part of the affair is the raw material. This must not, on any account, be new. To make a new word of new stuff is so excessively vulgar, and exposes such an utter destitution of the real mummy rag, that it cannot be thought of for a moment. If our ancestors had been like their hopeful progeny, what a pretty language we should have had. What nice household words they would have provided for us. Instead of a ton of potatoes, we should have had 157 *kilogrammes of solanum tuberosum*. A peck of peas would have been a *decalitre of pisum sativum*. Instead of names, we should have had definitions; and mechanics and market-women would have been compelled to talk like bug-and-beetleologists. A modern sermon would have required several Sundays; and the *Times*, a double supplement to report a ministerial speech. When will the tide take a turn? Surely we have had enough, and more than enough, of this pedantry. Surely, for such vulgar things as measures and weights we might be content with short, simple names, and leave Greek and Latin for butterflies and periwinkles.

Persons who can only "read a little," have a great horror of long words. When Frenchmen were called upon to use chiliometre for ligue, and call it kiliometre instead of shiliometre, it is not to be wondered at that they should not be enraptured with the new nomenclature. It is true that some daring Frenchman changed its head, and knocked an i out of it, and made it kilometre. But the system was left full of tautology; it was still full of *are, are, are, stere, stere, stere, litre, litre, litre,* and *metre,*

metre, metre. A number of things to be easily remembered, and distinguished from each other, should be as different from each other as possible. John and Mary are never confounded, but Francis and Frances frequently are; and so are Herefordshire and Hertfordshire. Decimetre and decametre differ only in one letter, and that letter a vowel. If the French had given simple names to their measures and weights, and placed them in children's spelling-books, in the order of the tables, the children would have learned them and their sequence while learning words of one syllable. Another result of their unfortunate choice of a nomenclature has been the limited number of their denominations. It is true they broke through the system in respect to weights; but their measures are too limited, and occasion a frequent use of fractions. Our wire and sheet metal gauges, expressed in millimetres, would require the use of two decimal places; and the prefix myria so lengthens out the word that people prefer the use of an extra cypher. Amongst English mechanics, three-eighths are pronounced three-aets, when followed by another word; and we have three-aet taps, three-aet bolts, &c. And they would not take very kindly to three millimetre taps and five millimetre screws, either in writing or speaking. Nor would a pint or horn of beer be relished any the more for being called a decilitre.

Half a kilogramme of sugar, and half a decigramme of tea would sound odd in the ears of English labourers' wives, who have been in the habit of using such simple words as pound and ounce. A person was once asked which was the greater, decimetre or decametre? and could not tell. He had frequently translated French measures into English, had seen the words scores of times, and was considered a cleverish fellow, but was here entirely at fault. He knew, in fact could not easily forget, that *pied* was greater than *pouce*, but decimetre and decametre beat him. His memory failed him, so he tried his judgment. Deca was Greek, and Deci Latin; Greek was older than Latin, and therefore would most likely come first, so he decided that the upward order would be decagramme, gramme, and decigramme. His memory failed him, and his judgment misled him. The same person, after a visit to Portsmouth, could give the names of all the vessels in port, save one. That one's name was either the *Rifleman* or *Sharpshooter*, but which, he could not say. Their names were different, but their meanings the same, hence the confusion. Every child is obliged to mind his p's and q's, but never confounds S with O.

Let us hope that there is a chance of escape from a French-Greek-Latin nomenclature for English measures and weights. The rage for Latin is decidedly on the wane. Latin mottoes do not so frequently appear on title pages; and Latin proverbs are not so frequently quoted in the "House," where English ones would be more apposite. Botanists have actually coined a new word out of new stuff, the word sepal, and Professor Thomson, in his excellent work on the differential and integral calculus, sticks up manfully for formulas, maximums, and minimums, and who knows but we may some day see datums, and stratums, alongside of memorandums? The language may be enriched by a careful introduction of foreign words, but in the name of common sense do not let us have any more methods of pluralizing.

If any doubt the value of a decimal system, point to the French, and say, "There is a system as bad as dilettanteism and pedantry could make it; yet, in spite of all its faults, such is the great utility of decimal measures and weights that it, even it, has to a certain extent been tolerated and by many extolled, and all because it was decimal."

J. Simon Holland.

WRIGHT'S IMPROVEMENTS IN MANUFACTURING BOILERS, IRON SHIPS, ETC.

In the ordinary manufacture of cylindrical boilers, the plates are so arranged that the riveted joints run in lines parallel to the axis of the boiler, and in planes perpendicular to the axis; or, in other words, the joints run in the direction of the length of the boiler, and at right angles to it. The joints running parallel to the axis of the boiler, or the longitudinal joints, it is well known, are subjected to a greater strain than those crossing them at right angles and running round in planes perpendicular to the axis, and consequently the longitudinal jointing is the weakest, and the part of the boiler first to give way under great pressure.

In order to remove this defect, Mr. E. T. Wright, of Wolverhampton, has patented an invention which consists in so arranging the riveted joints of boilers, and other articles of similar manufacture, that they shall not run parallel to the axis, but in a line oblique thereto, the lines of plates being made to run round the axis of the boiler in a helical or corkscrew direction, and the joints either at right angles to one another, or varying from a right angle, so as to be oblique to the direction of the greatest strain. "By thus placing the lines of riveted jointing

oblique to the direction of greatest strain," says Mr. Wright, "any given amount of such greatest or lateral strain is resisted by a greater length of jointing, and consequently greater number of rivets, than when such line of jointing is situated parallel to the axis of the boiler, whilst the whole length of jointing and number of rivets in the boiler is not increased, or is increased only to an inconsiderable extent."

Fig. 1 of the accompanying engravings represents in side elevation a cylindrical boiler of the improved construction, with

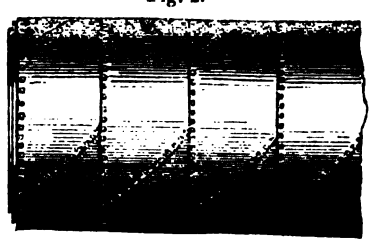
Fig. 1.

hemispherical ends. The oblique position of the joints and the arrangement of the plates in the form of helices are so clearly indicated that a further description is not necessary.

"The amount of increased strength of joint will appear," says Mr. Wright, "on referring to fig. 1. The dotted line, *a b*, will represent a given length of lateral strain, say 1 yard. This amount of lateral strain, instead of being resisted by only 1 yard, or an equivalent length of jointing, it will be perceived, is resisted by a length of jointing represented by the two lines, *a c* and *c b*, together equal to 1,414 yards."

Fig. 2 represents, in side elevation, another cylindrical boiler. In this the plates

Fig. 2.



are disposed in the usual manner, but they are not rectangular, but of a lozenge-shape, or have ends which, although parallel to one another, are not at right angles to their sides. Mr. Wright does not, however, consider the mode of construction shown in fig. 2 to be so desirable for boilers as that shown in fig. 1, because the length of jointing in the boiler is increased.

The application of the invention to iron ships, &c., consists of an oblique arrangement of the riveted joints, similar to that before described and illustrated.

IMPROVEMENTS IN STEREOTYPING.

A paragraph of a somewhat unintelligible character was recently published in several journals, describing an improved process of stereotyping introduced by Mr. James Hogg, the publisher, of Edinburgh, and a Mr. Napier, a stereotyper of the same place. As the invention is an important one, we have obtained the following reliable account of it. The first part of it relates to the formation of the matrices, and is as follows:—Firstly, a thick viscid plate is to be prepared by the intimate admixture, in about equal quantities, of red ochre and fine whiting, together with a sufficient quantity of prepared thin glue, starch, and wheaten flour (also in about equal proportions) made up into a paste, a little alum being included in the latter compound. Of the glue and paste there is to be employed just as much as is necessary, when all the components have been properly mixed to make the compound a stiff paste. A quantity of this is then to be spread upon the surface of a piece of stout packing paper, cloth, or other suitable fabric, and a straight edge of any convenient kind passed over it, so that the coating of paste may be rendered uniform in thickness. The amount of paste spread on should be about equal to the thickness of a threepenny piece, as at present issued from the Mint. This combination of paste and packing paper (or other substance) is now allowed to stand under the influence of the atmosphere for about half an hour, until the surface becomes nearly dry.* The "page" or "form" of which a cast is required to be taken is next laid down with the face uppermost, a slight coating of lard or other oil being brushed over it, and the flat matrix laid down upon the face of the types or "form," that surface upon which the paste or composition has been spread being next the oiled face of the "form."

* In forming the paste which produces the surface of the matrix, it is to be understood that the patentees do not confine themselves to the exact ingredients or proportions above specified. Various earthy substances, in different proportions, may be employed, but those mentioned are found preferable. It should, however, be distinctly understood that the liquid glue and paste are essential ingredients in the composition, incorporating the earthy substances it may be found convenient to employ.

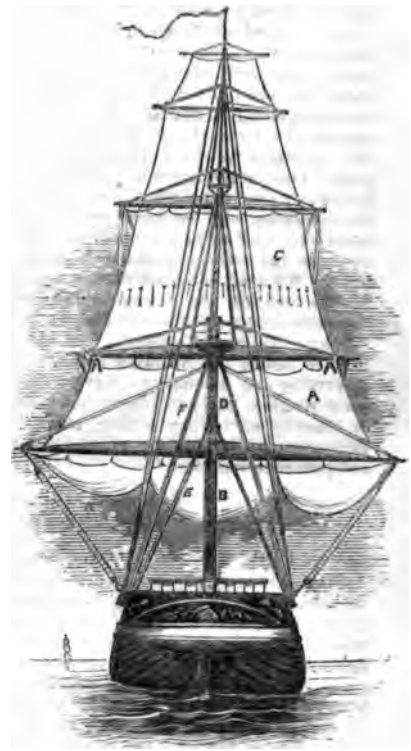
In this condition, the whole is to be subjected, in a printing press or other convenient apparatus, to slight pressure, sufficient to press firmly and evenly the matrix into the face of the types upon which it has been laid. A single and very light "soaking" pull at a printing press is sufficient for the purpose, or the impression may be taken by the implements known to printers as a "planer and mallet," used in the same way as when "planing over" a form of types. After the impression is obtained, the matrix must not be moved from contact with the "form" until it has been partially dried, and while this is going on, it is necessary to place a weight of some sort upon the back of the matrix. The best way is to place the bottom of the "form" or "page"* upon a plate of heated metal, keeping at the same time some flat heavy weight upon the back of the matrix. In a short time (varying according to the amount of heat employed) the matrix will have partially dried, whilst lying upon the face of the "form," and when withdrawn therefrom will be found to afford an exact reverse copy of the "form" or "page" operated upon.

IMPROVED RIG FOR VESSELS.

THE invention shown in our engraving consists in the introduction of an extra sail and yard, A', between the lower sail, B, and the top sail, C. For this purpose the lower mast, D, is elongated, and strengthened by double shrouds, or rather by dividing the shrouds, as indicated by E F.

The improved yard and sail are attached to the mast in the same manner as the present lower yards and sails. The inventor reduces the length of the top masts in proportion to the increased length given to the lower masts, so that the weight carried aloft is no greater than that involved in the ordinary rig. The division of the shrouds is alleged to afford a better support for the lower masts, notwithstanding the increased length.

The inventor does not claim the dividing of the top sail, as in Forbes' or Howe's rig, but the employment of a separate and distinct sail and yard, which he calls a Storm Yard and Sail, on the lower mast, so that in the event of a ship losing her mast heads or topmast, the vessel would still have storm sails and courses remaining, to work with. It is said that on ships rigged in this manner the yards could be so distributed as to have one reef in the top-



sail, or none at all, as desired, thereby avoiding the many accidents in reefing.—*Scientific American.*

* Where the words "page" or "form" are used, it is to be understood that these phrases include one or more pages, or portions of pages of combined types or woodcuts, or any other raised or sunken surfaces of which a counterpart may be required.

CUNNINGHAM'S PATENT SELF-REEFING TOPSAILS.

WE observe that some of the largest sailing merchant ships in the world are now being fitted with the above important nautical invention. The *Great Tasmania*, of 2163 tons register, has just been fitted, at Liverpool, with Mr. Cunningham's topsails and top-gallant-sails, and also the *Eastern Monarch*, of 1900 tons, at Dundee, belonging to Messrs. Soames. This invention is calculated to work an immense change in navigation.

THE CLARENCE VICTUALLING-YARD RAILWAY.

A branch from the South Western Railway has recently been led into the Royal Clarence Yard at Gosport, traversing the whole length of the storehouses and quays. Some years since a branch line was led just within the walls of the establishment for the accommodation of Her Majesty, and it is a subject of surprise that it has not been before extended to the working part of the yard. During the late war, provisions were frequently sent from the Clarence Yard to Southampton, and on such occasions, the casks, &c., had to be transported from the stores to the railway trucks with much labour. We avail ourselves of this opportunity to mention the general excellence of the engineering arrangements of the South Western Railway Company, and particularly to notice the liberality with which it entertains and encourages every improvement which is likely to add to the efficiency or security of railway rolling stock. In this respect, it is certainly a model for other companies to imitate.

MARTIEN AND BESSEMER.

To the Editor of the Mechanics' Magazine.

SIR,—I was rather disposed to be severe on Mr. Green, on reading his unseemly vituperation, until I reached the signature, when my eye and soul were soothed and appeased by the refreshing verdure. The name and the matter are most apposite; his errors are an enlarged edition of a mistake in the *Builder*, 27th ult., which I corrected in last *Mining Journal*; and to save any one the trouble of publishing a third edition, I will illustrate, by a little practical detail, the safety of the old precaution, that a writer should understand something of a subject before he writes on it.

There are three well-known processes for producing malleable iron. The first, to begin in the reverse order of time, is the puddling of cast iron in a reverberatory furnace. The second, is the producing the same chemical changes upon cast iron in a shallow blast furnace, called the refinery, or hollow fire. The third, is the charging a similar shallow blast furnace, not with cast iron, but with iron ore; the malleable iron is here obtained by a different chemical process; in the two first methods, an alloy of carbon is removed from the previously cast iron; in the last, the chemical equivalent of oxygen is simply removed from the ore. This process is the oldest, probably the secret of that first patentee, Tubal Cain. It is applicable only to rich ores, and is very wasteful. The old remains of these furnaces in England are called bloomeries; but though the antiquated process of the whole world, and still in existence in the uncivilised recesses of the East, it is styled in Europe the Catalan forge, indicative, I presume, that Spain is so far behind all the world in the race of progress. The second process was the only means of making malleable iron in England, before Cort's invention of the first. Nor is it yet entirely dismissed, the charcoal finery or hollow fire remaining in use for decarbonizing cast iron for the best wire and tin plate. Now all these processes were empirical in their origin; and not only the oldest, but the latest, for Black and Hartley in their eulogies of the vast prospective value of Cort's practice are quite at fault on his theory. They could not know what was not known. Not until Lavoisier made his great discovery of the oxidizing principle, and substituted knowledge for the profoundest ignorance, could any ironmaker have the slightest idea of what he was about. Long before the head of the philosopher fell from the guillotine, his personal equivalents decompounded by the fury of that wildest development of the wild beast man, a radical reforming mob, my father had applied his science to the explanation of the iron manufacture, and in the year 1794, being then twenty-four years of age, he had already completed a vast number of experiments towards realizing a *fourth* method of obtaining malleable iron not founded empirically in the dark (and which blind processes really are, in some degree, as the fruit of a persevering instinct, the most wonderful of inventions), but strictly by the light of chemical principle. He proposed to *deoxidize* the ore in *close chambers* by contact with heated carbon, to save the wasteful exposure of material involved in the blast bloomery process, and having thus malleabilized the ore, to weld it into workable balls in the Cort reverberatory, thereby uniting the earliest and the latest processes of the manufacture. He quickly satisfied himself that none of the ores of Great Britain were of a quality to permit of this manufacture being economically established, but the great simplicity of the process, the *naturalness*, so to speak, of simply removing the oxygen which deprives the iron of its proper malleability, instead of the triple operation of deoxidizing it, carbonizing it, and then decarbonizing it, has very much recommended it to philosophical attention, and during more than sixty years which have elapsed, the hope of eventually realizing the process has continued to linger. Your readers will now be able to appreciate the character of the attacks I have been amused with. First in

the terrific onset came Mr. W. Truran, who has, it seems, established himself in the office of iron beadle, vigorously flogging every one within his reach, as the duty of that office, and comprehending us all for auspicious offences. Happening to refer to my father's labours, he forthwith charged me with robbing Tubal Cain, and fixing me in the frightful dilemma, that I must either prove no iron was made before 1794, or that my father's name stood first in the parish registers of the world before the flood. Had I not been a man of iron, Dogberry might have brought in Francis Seacoal and his inkhorn, but it proved much ado about nothing. And now, sixthly and lastly, *Verdes* has come in thirdly, to "verify unjust things."

The great prevalence of rich magnetic ore in the United States seems to have attracted Mr. Renton to the process of malleabilizing iron by direct deoxidation. He improved my father's process by uniting the deoxidizing chamber with the puddling furnace, placing it above, so that the ore, as soon as deoxidized, should fall into the reverberatory, and using the waste heat of the reverberatory for the deoxidation. A company was formed for introducing this process in England, one of whom was Mr. Martien, and he came over about two years since to conduct the business. Some indirect applications were made to me respecting the best sites, &c., for the new operations, the first being in May, 1855, but they came to nothing; for I was always of opinion that there is no ground for expecting in this country that such a method can displace the vast capital and plant embarked in smelting for cast-iron. Mr. Martien, it appears, eventually planted his operations at Ebbw Vale, the proprietors, from what I have lately heard, evincing habitually a most unusual liberality in affording the facilities of their works for the efforts of inventors in the enlightened improvement of the iron manufacture. Now what Mr. Green and his clique are endeavouring to insinuate is, that I was acquainted with Mr. Martien's refining invention *at the time* when I first condemned it, when suffering under the general deception that it was the invention of Mr. Bessemer. With this laudable view, the editor before referred to translates my expression, "that I had been invited through a third party (Mr. Avery) to examine Mr. Martien's plans, and visit the RENTON furnace at Ebbw Vale," into the very mistaken paraphrase "that I had been especially invited to examine Mr. Martien's plans, and *witness his astonishing experiments.*" Now the writer of this free translation, as well as Mr. Green, may be ignorant what the Renton furnace is, and I therefore have explained so minutely the various processes for making malleable iron to preclude any future ignorant confusion. The whole of Mr. Green's attack is based on the same error: he keeps repeating, that I had declared I had "no faith" in the process from which Mr. Bessemer and his agent endeavoured to eliminate a patent for themselves. I said nothing of the sort; I never heard of this process until I read the Cheltenham paper. I said I had "no faith" in the Renton process as an object of enterprise in this country. Mr. Avery communicated with me on this plan of iron making only; it was this I was invited to see, being the only iron-making process that I knew Mr. Martien was engaged in until I read Mr. Avery's claim in the *Mining Journal*, August 23rd. I met that claim the next week on public grounds, upon the evidence before me, truly not dreaming that the supposed Bessemer invention was a mere pirated imitation from the prior patentee, under the extraordinary circumstances which have since come to light. It was *prima facie* evidence to my mind against the claim set up by Mr. Avery, that Mr. Martien was occupied in the old deoxidizing process, and I expressed that opinion; but I could not know that in doing so he was honourably preferring the interests of others, and keeping back his *own invention* (proved a month before the lengthy Bessemer provisional was filed) for the sake of the other invention which belonged to his Company. The first direct communication I ever had with Mr. Martien was on the 6th of September last, as can be very sufficiently proved; and then, it is true, I did learn things that astonished me.

It thus appears that I had been deceived "by somebody and his friends" in common with every one else, by the assertions made at Cheltenham, first that Mr. Bessemer was the inventor, and, second, that he had overcome those practical difficulties on a large scale, to which I hinted in my first letter in the *Mining Journal*. I said in that letter it was impossible to doubt the veracity of Mr. Bessemer, as the inventor of a beautiful process which had escaped the attention of practical men. I gave him credit for good faith, and the question since raised is, whether he is entitled to either. Ebbw Vale was a spot not entirely unknown to him. It is a singular fact, that the original and much more beautiful process of Mr. Martien with 800 blowers, of which the 5 tuyered cupel is only an attempt at colorable evasion, was proved in a small furnace which had been built at Ebbw Vale to prove a slag patent, in which the names of the patentees are

Bessemer, Longsdon, and Smith! About 100 persons, credulous and incredulous, witnessed Martien's success in this furnace. It is not much above thirty days' journey by camels from Ebbw Vale to London, and in a month after Mr. Martien's success, a remarkably pretentious specification was filed, which relies entirely for its validity upon a claim, which Mr. Carpmael so perseveringly insisted upon expunging from Martien's prior patent. Mr. Green is therefore right in his suggestion, that "a strong light has dawned upon me, revealing the fallacy" of my original praise of the *Bessemer process*, and of my confidence in the veracity of the propounder of the new and beautiful application of air to liquid iron.

Mr. Green insinuates, by suppressing the Christian name, that I appear in the patent list "for improvements in the manufacture of iron." He knows that I *do not;* and if he surmises that I have any connection with the patentee and his doings, he never was more mistaken in his life; and if Mr. Martien is in any way connected with them I am equally mistaken. I certainly am of opinion that the original invention, just as Mr. Green quotes, is superior to the colourable imitation of it. I praise the last as good, but I praise the other as better as soon as I am acquainted with its existence. It is untrue that I have admitted "that bars of iron 12 feet long, and half an inch thick, have been produced from Mr. Bessemer's ingots." On the contrary, I complained that I had heard of only one such alleged bar, part of it being at Baxter House, part at Woolwich, and part made into a tobacco-box in the country; and I advised that a ton or two of ingots should be at once rolled into proper bars, to give the *promisers* an air of respectability and business. This certainly is giving a considerable "twist" to the "elasticity of the English language," in which turned sense I presume the word "remorse" is used. Remorse is only applied to the feelings of the guilty; and I presume Mr. Green does not intend to assert that any guilt attaches to the disappointed parties in this case.

Finally, I would recommend Mr. Green to avoid ophthalmia. Cold winds and November fogs are approaching. Instead of the hazardous exposure of watching a public weathercock, to see which way the wind blows, direct his eyes at home to what I have written, and let him *understand* before he *censures*. This is not the verdant season out of doors. He can reappear in spring, by which time he will agree with me that it requires neither a witty nor a clever man to evade Mr. Bessemer's patents; *for it is quite clear* he has no patent at all, and I am sorry for it, and for all the strange circumstances in connection.

I am, Sir, yours, &c.,
DAVID MUSHET.

October 21, 1856.

DEATH OF MR. RENTON, THE AMERICAN INVENTOR.

WE learn from our contemporary the *Scientific American*, that Mr. James Renton, of Newark, New Jersey, United States, died 26th September last. He was the inventor of the method of making malleable iron direct from the ore, as described at page 246 of our 62nd volume, to which reference is made in Mr. Mushet's letter on another page of this number.

FIBRE IN IRON.

To the Editor of the Mechanics' Magazine.

SIR,—In the course of some interesting remarks upon Mr. Bessemer's discovery, in *Mech. Mag.* of 20th Sept. last, page 271, a paragraph occurs commencing, "What is fibre in iron?"

The question is one of the highest import in reference to Mr. Bessemer's process, as well as on other and more general grounds. I am not going to discuss it here; but, believing that I have been myself enabled to throw some new light upon it—indeed, to find the key to the whole subject of the molecular arrangement of iron in all its various states of cast iron, steel, and wrought iron—I take the liberty of thus drawing the attention of such of your readers as are interested. My views may be found in my work "On the Physical Conditions Involved in the Construction of Artillery,"* recently published by Messrs. Longman.

I am, Sir, yours, &c.,
ROBERT MALLET.

BEVIL WHEELS.

To the Editor of the Mechanics' Magazine.

SIR,—A few remarks on the way of striking out bevil wheels, and also the making of the patterns, by some of your able writers in the *Mechanics' Magazine*, will greatly oblige

Your obedient servant,
CONSTANT READER.

Neath, October, 1856.

* A review of this work is in course of preparation.—ED. M. M.

DR. LARDNER'S INVESTIGATION OF THE MOON'S MOTION.

To the Editor of the Mechanics' Magazine.

SIR,—"A Looker On," acting in accordance with the low forensic maxim—"When you have no case, abuse the opposite counsel"—resorts, in lack of argument, to the cheap expedient of assailing me with taunts and coarse imputations of ignorance. In this style I cannot condescend to retort; but, eschewing personalities, I will proceed forthwith to the proper subject of discussion.

I presume it will not be denied that Dr. Lardner (in his investigation) attributes to the mass, B, in his diagram, rectilineal motions in four different directions at once, namely, towards B′, towards B″, towards O, and towards C; that is to say, forwards, backwards, left, and right at the same time! All these independent motions he gives us to understand are "disguised" in the circular motion about the centre, O. It is clear he cannot mean *tendencies* to motion; for in that case his reasoning would be without coherency. On the contrary, he assumes that because *theoretically* any given motion of a body may be regarded as resolvable into two or more others, we must admit the actual coexistence of these latter. On this principle, a north-easterly motion combines two motions, one northward and another eastward; the northerly motion likewise includes a north-westerly, &c.; the north-westerly also includes a westerly, &c.; and so on all round the compass—motion towards any one point merely "disguising" the coexistence of all the rest.

Whether this conclusion be "a piece of nonsense," or otherwise, it is by no means "Mr. Good's own," but is the joint property of "A Looker On" and other "dynamicians" who admit the soundness of the premises from which it is a logical deduction.

I am, Sir, yours, &c.,

S. A. GOOD.

October 27, 1856.

MANUMOTIVE CHAIRS.

To the Editor of the Mechanics' Magazine.

SIR,—In reply to the inquiry by "Presbyter Claudicans," in your Magazine, I may state, that a few years ago I used to see a lame man, who could wheel himself through all the streets of this town in a small, clumsy wood cart. This was effected by a crank shaft placed before him when seated, having on its end a pitch wheel for a pitch chain, working over a larger pitch wheel on the axle of running wheels.

C. B.

Dundee, October 22, 1856.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

PLANQUE, C. D. A. J. *Improvements in the manufacture of fecula.* Dated Feb. 25, 1856. (No. 482.)

This invention refers to obtaining fecula from potatoes and other tubercles, and consists in a peculiar method of treating the residues resulting from common manufacture, by subjecting them again to the action of the rasp and of millstones, with admixture of water and chemical agents.

SLAUGHTER, E. *Improvements in the fire boxes of locomotive and other steam boilers.* Dated Feb. 25, 1856. (No. 484.)

The patentee employs two midfeathers, or water partitions, constructed in an inclined position in a fire box; these midfeathers are made with numerous passages and are tied or stayed by hollow stays, by which means the fire bars are divided into two sets of unequal lengths. The fire over such fire bars is in one case larger at bottom than it is at top, and in the other less at the bottom than at the top; and by the midfeather being perforated in numerous places, the products of combustion from one fire may pass to the other, and an extended heating surface is obtained.

BARROW, J., jun. *Improvements in the manufacture of soda, sulphurous and sulphuric acids, carbonic acid, chlorine and muriatic acid, and apparatus used therein.* Dated Feb. 26, 1856. (No. 485.)

These improvements consist,—1. In the use of manganese or any of its oxides, or the oxide of manganese in combination with carbonic acid, as carbonate of manganese along with coal or other carbonaceous matters for decomposing sulphate of soda, thus obtaining carbonic acid and carbonic oxide gases, soda, and sulphuret of manganese. 2. In the conversion of the carbonic oxide into carbonic acid, and its application to the conversion of soda into carbonate of soda or for other purposes. 3. In the use of sulphuret of manganese for obtaining sulphur, sulphurous acid, sulphuric acid, or sulphate of manganese. 4. In the decomposition of chloride of sodium by sulphate of manganese, with the production of sulphate of soda and chloride of manganese. 5. In the decomposition of the chloride of manganese into free chlorine or otherwise into muriatic acid and oxide of manganese. 6. In the arrangement of retorts so as to collect and render useful by conversion into carbonic acid the carbonic oxide formed during the decomposition of the sulphate of soda.

HENN, S., and T. HADDON. *Improvements in the mode or modes of forming or making the heads* of ornamental nails, when

such heads are formed of a different metal or metals, from the shanks of the same. Dated Feb. 26, 1856. (No. 487.)

This invention consists in the application of the well-known appliances used for pointing certain description of nails, and forming rivets, to that of pointing and partially forming the heads of ornamental nails, such heads to be further formed in suitable moulds, by casting over them brass or other metal, and finished by placing them in a suitable bed, and forcing the head into a die.

STEEDMAN, J. *An improvement in pianofortes.* Dated Feb. 26, 1856. (No. 490.)

This invention consists in the employment of curved or arched bars for the support of the sounding board and central bridge in pianofortes, whereby this bridge is maintained at such a height as to ensure a curve in the strings when at their greatest tension.

CORNES, J. *Improvements in machines for washing and churning.* Dated Feb. 26, 1856. (No. 491.)

This invention consists in mounting upon an axis supported in the sides of a box, two or more hollow cases with apertures in the sides thereof. These vessels receive the articles to be washed in washing machines, and are the dashers in churning machines. The sides of the vessels converge to the centre, through which a rod is passed as the axis upon which they rotate. Their outer ends are formed of two side plates and a central plate, the latter being moveable and retained in place by a button. The central plate serves as a door through which to change and remove the contents of the vessel. A crank handle is formed on the central rod whereby the vessels are caused to rotate. A cover made to fit the box completes the apparatus.

SCHAFER, P. and F. *An improved apparatus for damping gummed stamps, tickets, labels, and envelopes.* Dated Feb. 26, 1856. (No. 492.)

This invention consists of an apparatus in which both the upper and under surfaces of a stamp, &c., are damped at the same time. In a small case the patentees place a reservoir for water, and fit over it a sponge, pad, or other absorbent, which they cover, for neatness, with a piece of linen. They hinge a cover to the apparatus, and fit in the cover a pad of cloth or other material.

THOMPSON, F. *An improvement in skates.* Dated Feb. 26, 1856. (No. 493.)

This invention was described and illustrated at page 318, of our number for Oct. 4th. (No. 1730.)

BROOMAN, R. A. *A composition or compositions to be used as a substitute for hops in brewing.* (A communication.) Dated Feb. *26, 1856.* (No. 494.)

This invention consists in the manufacture of a composition called "lupuleid," by adding two parts by weight of nitric acid to one part of some resinous substance, such as Burgundy pitch broken into small fragments, and heating the mixture over a slow fire until it begins to distil and give off gaseous bubbles, when it is moved from the fire and allowed to bubble over on to a receiver, the heating, &c., being repeated until the acid ceases to work the resin and throw it over. After cooling, the product is washed to remove all traces of the acid, and then dried, after which it is ready for use.

PARRY, G. *An improvement in the puddling and refining of iron.* Dated Feb. 26, 1856. (No. 495.)

This invention consists in subjecting iron, while in a molten state, to the action of the elements of water, for disengaging the sulphur and other impurities. Instead of using common steam, which chills the metal, the patentee superheats the steam prior to injecting it.

RECKITT, I., G., and F. *Improvements in the manufacture of starch, British gum, and size.* Dated Feb. 26, 1856. (No. 496.)

Claim.—The manufacturing starch from millet; also, the application of a crushing or levigating machine when manufacturing starch from millet; also, the application of an inclined plane as a means of separating the starch from the gluten of millet; also, the use of caustic alkali, acetic and hydrochloric acid, alkaline salts, and caustic lime when manufacturing starch from millet; and also, the manufacture of British gum and size from millet.

BOUSFIELD, G. T. *Improvements in power looms.* (A communication.) Dated Feb. 26, 1856. (No. 497.)

These improvements relate to driving and stopping power looms, particularly to looms driven by friction cones. The improvements consist in detaching the balance wheel from the driving shaft, and connecting it with or adding its equivalent in weight to the belt cone for driving the loom, thus causing the said balance wheel to be kept in motion by the belt when the loom is at rest.

FONTAINEMOREAU, P. A. L. DE. *A new cicatrising preparation.* (A communication.) Dated Feb. 26, 1856. (No. 499.)

This preparation consists of the following substances. Solanum nigrum (morelle) 5 oz.; balsamina impatiens, 4 oz.; thymælea (daphne), 8 oz.; solanum scandens, 4 oz.; symphitum (officinalis), 4 oz; flower and seal of the hypericum, 16 oz.; sedum minus, 16 oz.; flour of sulphur, 8 oz.; Venetian turpentine, 10 oz.; saffron, ½ an oz.; wine, 2½ qts.; olive oil, 6½ lbs.

EXALL, W. *Improvements in the manufacture and arrangement of sawing machinery.* Dated Feb. 27, 1856. (No. 502.)

This invention was described at page 349 of No. 1731.

ALLEN, E. E. *Improvements in the permanent way of railways.* Dated Feb. 27, 1856. (No. 503.)

The inventor constructs a rail of one or more parts, and connects the lengths together by suitable joint pieces; or where the rail is in two or more parts it may be done by breaking joint. The characteristic feature of this invention is, that the rail is sustained by longitudinal projecting plates or wings, one on each side of the rail, such projecting plates or wings being in different planes on the two sides, that is, the projecting plate on one side is at or near the upper part or head of the rail, and the projecting plate on the other side is at or near the lower part or head of the rail.

JOPLING, T. T. *An improved construction of water-meter.* Dated Feb. 27, 1856. (No. 505.)

This invention relates to reciprocating water meters. The patentee employs two measuring cylinders, each provided with a working piston, the rods of which severally carry a slide valve frame; or in lieu of the piston a flexible diaphragm may be used. These cylinders are enclosed in a water-tight case, into which the liquid to be measured first flows before entering the cylinders, and which case retains stones and other extraneous matters that enter with the liquid. The cylinders he so arranges that the ports of the one (for letting water into the cylinder at opposite sides of the piston alternately) will be covered by a loose slide valve, which is carried by a valve frame attached to and actuated by the piston rod of the other cylinder. The lead-off passages of the two cylinders all connect with a common discharge pipe, and as the apparatus is double acting, a continuous discharge will take place.

WALKER, F. P. *Improvements in machinery for cutting hay, straw, and other vegetable substances.* Dated Feb. 28, 1856. (No. 506.)

This invention consists in a mode of actuating the cutting knife by mounting it on cranks which impart to it a compound vertical and lateral movement by placing the plane of the axis of the cranks at an angle to the mouth of the feed box, or by connecting the knife to the cranks so as to form an angle with the feed box. The cranks are made to work simultaneously by toothed wheels or other suitable gear.

SMITH, J. *Improvements in water-gauges for steam boilers, which improvements are also applicable to cocks used for steam and other purposes.* Dated Feb. 28, 1856. (No. 508.)

This invention consists in the adaptation of a screwed rod and valves in the construction of water gauges for steam boilers, so that in the event of the glass gauge tube being broken, the pressure of the steam and water shall cause the valves to be closed instantly, and thus prevent the escape of the water and steam.

WESTHORP, I. *Improvements in concentrating milk, and in obtaining concentrated extracts from tea, coffee, and chocolate.* (A communication.) Dated Feb. 28, 1856. (No. 509.)

This invention consists in concentrating milk in vacuo, by apparatus which cannot be described without illustrations, and in preparing extracts of tea, coffee, and cocoa, either combined with the concentrated milk or not.

FOWLER, J., jun., and D. GREIG. *Improvements in ploughing and tilling land.* Dated Feb. 28, 1856. (No. 512.)

Several ploughs are placed at each end of a frame, in order that when those at one end go out of work, those at the other end may come into action. The frame is mounted on an axle in the middle, and moves thereon as on a fulcrum. The machine has wheels to run on, and is moved across the land by wire ropes put into action by a barrel or barrels caused to rotate by a steam engine. When the machine arrives at the end of its course in one direction, in place of having to turn it round, one set of implements go up out of action, and the other set descends and come into action, and this is effected by the draft of the wire rope taking place in the opposite direction.

ARCHER, E. T. *Improvements in envelopes for the transmission of letters or parcels.* Dated Feb. 28, 1856. (No. 513.)

This invention refers—1. To a particular plan of cutting and cementing the flaps of the envelope, whereby additional security is afforded when adhesive envelopes are closed, and the necessity of damping the gum with the mouth avoided. It refers—2. To mourning envelopes or envelopes to be ornamented, and consists in forming the black band or other designs by first embossing or printing in some adhesive pigment the requisite design, and afterwards applying flock or some suitable powder, either in black or colours as in the manufacture of paper hangings.

FONBONNE, C. A. DE. *Improved apparatus for the manufacture of coke and for blasting, also for the production and extraction of illuminating and combustible gas, as well as ammoniacal and bituminous matters, part of such apparatus being applicable to the consumption of smoke.* Dated Feb. 28, 1856. (No. 514.)

This invention consists in certain apparatus for performing the following processes—1. Manufacturing coke. 2. Manufacturing gas for illuminating and heating

purposes, and obtaining the carbonaceous, gaseous, bituminous, and ammoniacal products contained in pit coal, turf, schiste, ligneous matters, wood, and bones. 3. The application of a portion of the above mentioned apparatus to the consumption of smoke.

GROSRENAUD, P. L. *Certain improvements in apparatus or furnaces for melting and puddling metals.* Dated Feb. 28, 1856. (No. 515.)

This invention consists in an improved furnace in which fuel is economised, and also in the construction of elongated crucibles or melting pots. The improved furnaces are of two descriptions. In one description they are provided with one or more melting pots; in the other they are reverberatory furnaces, but modified in such manner as to allow of a higher temperature being attained than in reverberatory furnaces of ordinary construction; the principal difference being in the method adopted for heating, or rather for accelerating combustion. Both classes of furnaces may be made moveable.

BROOMAN, R. A. *Improvements in treating bituminous shale, boghead, mineral, and other like schistous bodies, in order to obtain various commercial products therefrom.* (A communication.) Dated Feb. 28, 1856. (No. 516.)

This invention consists in operating upon schistous bodies by means of certain apparatus and processes which cannot be completely described without engravings, the object being to obtain—1. Essential oil (of 60° of Gay Lussac's areometer). 2. A lighting oil (of a density of from 32° to 40°). 3. A lubricating oil. 4. A lubricating tar. 5. A solid tar. 6. A "black." 7. Another "black," similar to "animal black." 8. Paraffine. 9. Ammoniacal water.

BRIERLEY, J. *Improvements in machinery or apparatus for twisting and doubling yarns for mule-banding and similar purposes.* Dated Feb. 29, 1856. (No. 518.)

This invention consists in arranging two, three, or more bobbins, each filled with a sufficient number of threads to form "a strand." These bobbins are attached to rims or pulleys, either at right angles or parallel to them, so that each bobbin can turn on its axis, and revolve with the rim or pulley to which it is connected, the bobbins having thus a double motion. As each strand is conveyed to and wound upon another bobbin, they uncoil, and receive the necessary twist; but this being only confined to the strands, and all in the same direction, the band is not complete until two or more twisted strands are again twisted or doubled in a contrary direction, which is accomplished by placing the bobbin upon which the two or more twisted strands are wound on the other end of one of the shafts to which the rims or pulleys are connected.

GRAHAM, J. *Improved machinery for cleaning and dressing rice and other grain.* Dated Feb. 29, 1856. (No. 520.)

The object of this invention is to render the operation continuous instead of intermittent as at present. This is effected by supplying the material to be operated upon in a continuous stream to one end of the dressing machine, and causing a simultaneous discharge at the other end. The case for containing stones or cleaning surfaces he makes of wire work or perforated metal, and by preference of a conical form, and he shapes the periphery of the stones or polishing surfaces to correspond thereto.

GREENWOOD, J. *Improvements in heating water for the supply of steam boilers.* Dated Feb. 29, 1856. (No. 521.)

These improvements relate to heating the feed water for boilers by causing it to pass through pipes placed in folds in the flues, the successive folds being laid in a horizontal direction against or near to the sides or inner surfaces, and lengthwise of the flues or flue spaces; but the patentee avoids placing them in contact with the surface of the boiler.

CONNOR, F. *Improvements in looms for weaving.* Dated Feb. 29, 1856. (No. 522.)

These improvements relate to means for obtaining a more elastic tension upon the yarns, especially when employing let-off motions to the warp beam, governed in their movement by apparatus in connection with a rocking or vibrating bar, over which the yarn passes from the warp roller to be woven, and consist in substituting for the weight heretofore applied a spring or springs (capable of being regulated) to act upon the vibrating or rocking bar or lever.

BARLOW, C. *Improvements in machinery for cutting cloth, and other textile fabrics.* (A communication.) Dated Feb. 29, 1856. (No. 523.)

This invention consists in arranging upon, or attaching to a cylindrical or other surface, knives or cutters in any desired shape or pattern, and so that they can be changed in position to vary the pattern.

TURNER, W. A. *Improvements in the manufacture of elastic tubing.* Dated Feb. 29, 1856. (No. 524.)

This invention relates to tubing made of India-rubber and gutta percha, either separately or in combination, and is designed for rendering such tubing capable of withstanding a pressure of from 50 to 100 lbs. on every square inch of surface. The novelty consists in combining with the aforesaid material a rigid substance, such as a helix or a series of rings of metal or other material.

ER, W. *The better extinction of set watering, and other purposes.* Mar. 1, 1856. (No. 525.)
nvention cannot well be described illustrations.

ING, J. *New or improved fastenings hing watch-keys, seals, watches, lockles of jewellery, and ornamental artidress in general to chains, and for the catches of brooches.* Dated Mar. (No. 528.)
fastening cannot well be described an engraving.

R, H. A. *Improvements in conveying nitting motion for effecting mechaniitions.* Dated Mar. 1, 1856. (No.

nvention relates to a chain of shaftich consists of short inflexible jointed to each other so as to form uous chain, by means of a series of known as Hook's joints, or unioints. The rotary motion of a power shaft may thus be conveyed he articulated descending shaft to best end of the latter. This jointed covered over with an articulated aving simple spherical joint pieces nding with each shaft joint coupt the end of the articulated line of , which projects from its tubular , provision is made for the attachoperating tools.

SON, J. H. *Improvements in looms for* . (A communication.) Dated Mar. (No. 530.)
is invention the principle of raising boxes of looms by means of a hook ife edge, in combination with an tappet or pattern chain, described tent dated 29th Feb. 1855, is rebut in place of requiring one hook ife edge to each shuttle, it is pro- use one hook and knife edge only, ook having two or more notches in above the other, according to the of shuttles employed, the distances the notches corresponding to the between each shuttle box.

E, P. R. *Improvements in the method ng domestic fires.* Dated Mar. 1, (No. 531.)
invention consists in the lighting of ic fires by gas from a portable appa-

CIS, A. *Certain improvements in the ture of a composition applicable as t or plaster, and to other purposes.* Mar. 1, 1856. (No. 533.)
invention consists in combining ith gypsum in a dry state, for which e the patentee first subjects the gypother calcareous substance to heat ine it, and then mixes therewith the dry borax, ground or otherwise reduced to a granulated or powdered state, without the aid of heat, or of the cream of tartar or other such acid, whereby he effects considerable economy in the manufacture.

KASELOWSKY, F. *Improvements in winding yarns and thread of flax and hemp in spinning and twisting machines.* Dated Mar. 1, 1856. (No. 534.)

In order to wind on a much larger quantity on a bobbin when using any given size of flyer, the bobbin is made with a flanch at one end only. And it is preferred that the bobbin should be of sheet metal suitable for being received on to the wood bobbin (formed suitably to receive it), placed on the spindle of the machine. The winding apparatus is arranged to commence its winding at the lower or flanch end of the bobbin, and to wind the yarn regularly up to the top, and then to move quickly again to the lower end, making a long spiral in so doing, and then again, the winding is regular up to the top; by these means the winding, when finished, will be of a cylindrical form, from the flanch upward to some extent, and of a conical form towards the upper end; when the yarn or thread is not for the shuttle, the winding may be regularly up and down, still however producing the upper conical end.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

LEGRAND, G. M. *Certain improvements in graining and checquering skins and woven tissues.* Dated Feb. 27, 1856. (No. 498.)

This invention consists in the employment of wire gauze in conjunction with strong pressure for obtaining an imitation of morocco leather from the skins of goats and sheep, and from calf and other skins, so as to give them a striped grain. This process is also applicable to striping caoutchouc, fabrics, and oil and other cloths.

JOHNSON, J. H. *Improvements in the treatment of hard India-rubber, for the purpose of rendering the same applicable to the manufacture of pens, tubes, springs, and other similar articles.* (A communication.) Dated Feb. 27, 1856. (No. 500.)

In this invention the caoutchouc is manufactured and hardened after the manner adopted by the Paris Hard India-rubber Company, being vulcanized in sheets on plates of glass or tinned metal, the composition consisting of about 100 parts of gum to from 40 to 50 of sulphur. The sheets, when intended for pens, are divided into strips of a width corresponding to the length of one or more pens. These strips are passed between polished cast-iron or steel rollers, heated internally, being first soft-

ened slightly by moderate heat. Or, in place of rolling, the strips may be subjected to a hammering process—the object of both processes being to draw out the strips longitudinally, whereby elasticity is imparted to them. The strips are then cut transversely, the width of the pieces cut off being sufficient to form, when curved up, either a semicircle or an entire tube, according to the style of pen to be made. The pieces are then nibbed and split, and exposed for a short period to a temperature somewhat higher than that adopted in the previous process, which has the effect of causing the material to shrink unequally or curl up lengthwise, the side of the material which was in contact with the glass or metal vulcanizing plate being much more sensible of the action of heat than the upper side of the material, so that the material will itself assume the curved or tubular form requisite for a pen.

JENNINGS, W. H. *An improvement or improvements in the manufacture of the guards and heel-plates of guns, which improvement or improvements may also be applied to the manufacture of lasso-rings and manillas.* Dated Feb. 27, 1856. (No. 501.)

This invention consists in making the moulds of iron instead of sand. The articles cast therein have so clear a surface that they do not require the ordinary finishing.

INGLIS, A. *An improvement in the manufacture of flexible bottles or cases for containing colours and other fluids and semi-fluids.* Dated Feb. 27, 1856. (No. 504.)

This invention consists in the application of gutta percha in the manufacture of such flexible bottles or cases.

THOMPSON, W., and C. WILSON. *An improvement or improvements in buttons, and in attaching the same to articles of dress.* Dated Feb. 28, 1856. (No. 507.)

This invention consists in making buttons with shanks having the form of an open tube. The tubular shank is passed through the article to which the button is to be attached, a washer is placed on the end of it, and the end of the tube is then spread out.

MARGESSON, P. D. *Improvements in the manufacture of iron from iron ores.* Dated Feb. 28, 1856. (No. 510.)

The inventor takes calcined ores (by preference) and powders, sifts, and mixes them with pounded coal or coke, &c., and fluxes, if necessary. The mixture is placed in a furnace, lighted at the top, and made to burn downwards by a blast, the points of application of which are gradually lowered as the mixture burns down. A malleable iron is thus produced.

FROW, C. *Improvements in furnaces for steam boilers and other purposes.* Dated Feb. 28, 1856. (No. 511.)

The furnace is arranged with two or more tiers of fire bars; the lower fire has an up draught, but the upper fire has a downward draught, the flame and smoke from the latter being caused to pass down through their own fire, and over that on the lower bars. The upper firegrate is of water tubes, which communicate at both ends with larger tubes connected with the steam boiler.

LOGAN, J. *Improvements in pumps, which improvements are especially applicable to bilge pumps on board ships and steam vessels.* Dated Feb. 29, 1856. (No. 517.)

The inventor places (in suction pumps) an oblong chamber between the pump and the end of the pipe, in which chamber the rose is placed: this serves as a receiver for dirt, and having a cover readily taken off, is easy of access, and may be emptied at any time.

MARKETT, J. *Improvements in the manufacture of envelopes.* Dated Feb. 29, 1856. (No. 519.)

This invention consists in perforating the edges of the paper of which envelopes are formed, and in bringing together two edges side by side, so as not to overlap, with corresponding perforations, and uniting them by adhesive compositions. It also consists in a peculiarly-formed envelope, in the shape of a pocket, with the paper whole at back and front, and folded over at one side.

CLARK, W. *Improvements in cutting or shaping trousers.* Dated Mar. 1, 1856. (No. 526.)

These improvements consist in cutting trousers with the front and back part of each leg in one piece, so as to do away with the seams on the insides of the legs.

MILLER, R. F. *An improved omnibus.* Dated Mar. 1, 1856. (No. 527.)

This invention consists — 1. In doing away with the ordinary seats and brackets, and making the bottom side of the body form the seats. 2. In raising the roof in the centre to form a convenient seat outside, and carrying the lower body down four inches lower than usual. 3. In extending the fore part of the body to obtain greater space inside without increasing the total length. 4. In doing away with the top ventilating rail and "mahogany," and carrying the glass up to the framing. 5. In carrying the pillars or frames down straight, thereby increasing the internal width. 6. In doing away with the hind cross spring, and fitting the front carriage with a double wheel plate, transom, &c. 7. In carrying rails round and along the roof and bottom side of the same, and fitting extra brass rods for hand holds. 8. In improving the lighting and ventilation at the fore part of the vehicle.

UYTBORCK, L. *An improvement in locomotive and other tubular boilers, in which*

steam is generated. Dated Mar. 1, 1856. (No. 532.)

In order to economise fuel, the inventor proposes to join by pairs a certain number of boiler tubes united at each end by a metal elbow or bend fixed to the tubes at each of their extremities, entering the distance of a few inches, a nozzle or lining copper inserted in the boiler tubes, the joints being properly luted at the junction. The elbows are attached to the boiler by screws.

CHAPMAN, W., and J. H. TEAGER. *Improvements in apparatus for cooking animal and vegetable substances, and for heating steam closets.* Dated Mar. 1, 1856. (No. 536.)

The inventors employ a steamer or vessel connected with a pipe from a boiler at the lower part. The lids of the steamer are made with rims, which dip into troughs, and are supplied with water which makes them steam-tight joints, so constructed that any condensed steam will run into the steamer. The steam passes out into an exit pipe connected with a steam closet or with a series of pipes enclosed in a closet.

POITIERS, E. *The application of a new material or materials for the manufacture of brushes and for other purposes, and for improvements in the manufacture of street scavengers' and similar brooms or brushes.* Dated Mar. 4, 1856. (No. 546.)

The new material is to be obtained from the leaflets of various members of the palm tribe, such as the cocoa-nut palm, &c. The material is the rib or spine running through the centre of the leaflet, and forming at its base the footstalks by which the leaflet is attached to the leaf stem.

PROVISIONAL PROTECTIONS.

Dated September 6, 1856.

2076. Sidney Wesley Park and Edgar Stimpson Ells, both of Troy, U.S.A. Improvements in machinery for knitting tubular ribbed fabrics.

Dated September 27, 1856.

2261. James Holland, of Manchester, Lancaster, dyer, and John Irving, of the same place, chemist. Improvements in the treatment of certain waste woollen yarns or threads, whereby the fibre or wool of which they are composed is rendered capable of being spun and manufactured.

2263. George Neall, wholesale brewer, of Northampton. An improved union gas stove for lighting and heating.

2267. Frederick Ransome, of Ipswich. Improvements in the manufacture of artificial stone, and in rendering it and other building materials less liable to decay.

2269. Joseph Edwards, of Liverpool, Lancaster, provision dealer. An improved ship's log. A communication.

2271. John Ormerod, of Salford, Lancaster, bleacher. Improvements in machinery or apparatus for bleaching and washing or cleansing textile fabrics and materials, applicable also to the "soaping" of printed fabrics.

Dated September 29, 1856.

2273. Jean François Victor Larnaudès, of Rue Gabrielle, Montmartre, France, gentleman. An anti-putrifactive and disinfectant.

2275. James Noble Ward, of the army of the United States. An improvement in the construction of self-priming firearms.

2277. Matthew Hickson, of Salford, near Manchester, Lancaster, gentleman. Improvements in waterproofing certain woven fabrics.

2279. Robert Morrison, of Newcastle-upon-Tyne, engineer. Improvements in the construction of apparatus for lifting, lowering, hauling, and removing moveable articles by the direct action of either water, steam, or gaseous vapour.

2283. Charles William Ramié, of Pimlico, Middlesex. Improvements in constructing the permanent ways of railways.

Dated September 30, 1856.

2285. Thomas Arthur Dillon, of Dublin, and John Gray, M.D., of Princes-street, Dublin, esquires. An improved means for making signals on railway trains between the guard and driver respectively, and between the passengers and guard and driver, and of giving notice to the guard and driver in case of the accidental severance of the parts of a train, which invention is applicable also to steam ships, factories, and other places where it may be requisite to communicate with distant points.

2287. Samuel Jay and George Smith, both of Regent-street, Middlesex. A new material to be employed in the manufacture of bonnets, hoods, hats or caps.

2289. Duncan Bruce, of Paspebiac, Bonaventure, Canada. Making a concentrated animal manure.

Dated October 1, 1856.

2291. Charles Louis Henri Quentin, of Rue des Petits-Hôtels, Paris, France, engineer. Making a new kind of artificial millstones.

2293. John Dauglish, of Great Malvern, Worcester, doctor of medicine. An improved method of making bread.

2295. James Begg, of Glasgow, Lanark, N.B., engineer. Improvements in preparing and bleaching textile fabrics and materials.

2297. John Paterson, of Linlithgow, N.B., engineer. Improvements in the manufacture of paper.

2299. Roger George Salter, of Alphington, Devon, engineer. A method of and apparatus for expediting the stamping or marking of letters, papers, labels, and documents, and improvements in and additions to stamping and marking instruments or apparatus, or in connection therewith.

2301. Charles Durand Gardissal, of Bedford-street, Strand, London. An improved construction of pump. A communication.

2303. Edward Wilcox, of Harmston, Lincoln. Improvements in pumps.

Dated October 2, 1856.

2305. Edwin Hardon, of Stockport, Chester, manufacturer, and Joseph Henry, of the same place, mechanic. Improvements in looms for weaving, and in machinery for communicating motion to looms and other machines.

2307. Joseph Renshaw, of Salford, Lancaster, machinist. Certain improvements in machinery or apparatus for cutting or producing the pile of plain or figured velvets or other pile-cut goods or fabrics.

2309. Daniel Desmond, of Upper Thames-street, London, beer merchant. Improvements in vessels

and apparatus for storing, improving, and discharging liquids.

2311. Robert Edmeston, of Bradford, York. Improvements in looms for weaving.

2312. Charles Goodyear, of Leicester-square, Middlesex. Improvements in securing the openings of air-tight and other bags and packages.

2313. Michael Thomas Crofton, of Leeds, York. Apparatus for indicating and registering the number of persons entering a public vehicle or carriage.

Dated October 3, 1856.

2315. Peter Armand Lecomte de Fontainmoreau, of South-street, Finsbury, London. Improvements in the construction of roofs of buildings, which improvements are applicable to the construction of arches of bridges. A communication.

2317. William Johnson, of Lincoln's-inn-fields, Middlesex, civil engineer. Improvements in the treatment, preparation, or manufacture of sheet caoutchouc, and in the combination thereof with cloth and other fabrics. A communication.

2319. George Fergusson Wilson and Alexander Isaac Austen, both of Belmont, Vauxhall. Improvements in the manufacture of soap.

2323. James Allen, of Castle place, Castle-street, Canterbury, Kent. Improvements in coats.

2325. Colin Farquharson and William Grimshaw, both of Mitcham, Surrey, engineers. Improvements in apparatus for indicating and regulating the pressure of steam in boilers.

Dated October 4, 1856.

2327. Alexis Picard, of Rue de l'Echiquier, Paris, France. An improved tobacco pipe.

2329. Walmsley Preston, of Over Darwen, Lancaster, manager. Improved machinery to be used in the manufacture of paper hangings.

2331. Joseph Betteley, of Liverpool, anchor manufacturer. Improvements in the manufacture of iron for knees for ships or other purposes.

Dated October 7, 1856.

2338. Robert Hazard, of Thanet-place, Strand, Middlesex, engineer. An improved apparatus for intercepting the smoke and heated gases in its passage from boilers, stoves, furnaces, and kilns, to the chimney, and thereby extracting a portion of its heat, which is made available for drying and warming purposes.

2340. Oglethorpe Wakelin Barratt, of Birmingham, Warwick, chemist. Improvements in the dyeing or staining and ornamenting of articles of pearl, bone, and vegetable ivory.

2342. Smith Bottomley, of Bradford, York, designer, and James William Crossley, of Brighouse, York, dyer. Improvements in the manufacture of pile or nap fabrics.

2344. William Wilkinson, of Nottingham, engineer. Improvements in casters, in the legs of tables, chairs, pianofortes, and other articles of furniture, and in apparatus for perforating caster wheels, which is also applicable to the perforating of glass articles generally.

2346. Joseph Bunnett, of Deptford, Kent, engineer. Improvements in the manufacture of metal sash-bars, columns, and mouldings, for building and decorative purposes, and for a method of protecting the same or other articles from oxydation.

2348. George Fergusson Wilson, of Belmont, Vauxhall. An improvement in the manufacture of rosin oil.

Dated October 8, 1856.

2350. William Ward, of Warrington, Chester, spinner and manufacturer. An improved manufacture of woven fabric.

2352. Francis Whitehead, of Crayford, Kent, draughtsman. A method of and apparatus for producing devices in or on wood, leather, and other similar surfaces, whether for ornamenting the same or for the production of printing and embossing surfaces therefrom.

2354. William Bradford, of Manchester, Lancaster, brass founder and gasfitter. Improvements in the arrangement of gas-burners for lighting and ventilating.

2356. Daniel Foxwell, of Manchester, Lancaster, card manufacturer. An improved mode or method of consuming smoke and economizing fuel thereby.

2360. Henry Watson, of High-bridge Works, Newcastle-on-Tyne, brassfounder, and John Dixon, of the same place, engineer. Improvements in cocks and valves.

2362. François Julien, of Trafalgar-square, Charing-cross, Middlesex. Improvements in ordnance or cannon.

Dated October 9, 1856.

2364. Thomas King, of Spitalfields, Middlesex, surveyor. An improved continuous compressing machine.

2366. George Hallen Cottam and Henry Richard Cottam, of St. Pancras Iron Works, Old St. Pancras-road. An improvement in the manufacture of iron hurdles.

2368. William Nairne, of Aberdalgie, near Perth. Certain improvements in the machinery for preparing flax, tow, and other fibrous substances.

2372. James Saul Hendy, of Essex-street, Strand, Middlesex, butler. Improvements in fire-stoves or grates used for domestic purposes.

Dated October 10, 1856.

2376. William Johnson, of Lincoln's-inn-fields, Middlesex, civil engineer. Improvements in railway brakes. A communication from J. J. Chatelain, of Nancy, France.

2378. Frederick Albert Gatty, of Accrington, Lancaster, manufacturing chemist. Certain improvements in dyeing.

2380. William Rennie, jun., of Lagan Foundry, Belfast, Ireland, engineer. Improvements in the condensing apparatus of steam engines.

Dated October 11, 1856.

2384. William Caswell Watson, of New York, U. S. A. Improvements in sewing machines.

2386. George Heppell, of Uttoxeter, Stafford, engineer. Improvements in ventilating mines and other like places.

2388. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. A new gaseous liquid to be used in generating motive power. A communication.

2390. Gustav Scheurmann, of Newgate-street, London, music publisher. Improvements in printing music when type is employed.

Dated October 13, 1856.

2392. George Elliott, of Newcastle-upon-Tyne. Improvements in the production of oxides of manganese.

2394. William and Jacob Todd, of Heywood, Lancaster, spinners and manufacturers. Certain improvements in power looms for weaving.

2396. Claude Eugene Mony, mechanician, of Paris, France. An improved mode of transmitting motive power.

2398. John Roscow, of Radcliff, Lancaster, drysalter. Certain improvements in machinery or apparatus for cutting or rasping dye woods.

Dated October 14, 1856.

2400. Richard Sumner, of Droylesden, Lancaster, overlooker. Certain improvements in power looms for weaving.

2402. Samuel Bremner, of Newcastle-upon-Tyne, stationer. Improvements in pouches or envelopes, and in machinery or apparatus for manufacturing or producing the same.

2404. Thomas Stokes Cressey, of High-street, Homerton, Middlesex, engineer. Improvements in machinery for cutting, hollowing, and backing staves.

Dated October 15, 1856.

2410. Bennett Johns Heywood, of Hawley-road, Camden-town, Middlesex, gentleman. Improvements in valves for inflating air-tight bags, cushions, and other similar articles, and for drawing off liquids.

2412. John Palmer, of Stockton-on-Tees, Durham, agricultural implement manufacturer. Improved machinery for separating different kinds of qualities of seed and grain from each other.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

2407. Joseph Henry George Wells, of Essex-street, Strand, London, mechanical draughtsman. Improvements in windlasses. A communication from P. C. Hardoy. Dated October 15, 1856.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," October 28th, 1856.)

1434. R. L. De Berenger. Improvements in nosebags.

1435. T. Burton. Improvements in machinery or apparatus for sizing and dressing warps, yarns, or threads.

1443. F. G. Spilsbury. Making soda and alum.

1445. T. Schwartz. An improved brick.

1448. W. Parsons. Improvements in washing and bleaching woven fabrics.

1452. J. T. Pitman. A new method of using the electric current or currents for telegraphic and other purposes. A communication.

1453. J. Bullough. Improvements in looms.

1464. C. Minne and A. Colson. Improvements in making bread.

1465. W. V. Miller. Improvements in propelling vessels.

1468. G. Gurney. Certain improvements in warming and moistening air.

1470. J. A. Longridge. Improvements in obtaining and applying motive power for the conveyance of minerals, pumping, and other purposes in mines in which motive power is required.

1471. G. Riley. An improved refrigerator for cooling brewers' and distillers' worts.

1477. E. Hardon, and J. Henry. Improvements in looms for weaving, and in machinery for communicating motion to looms and other machines.

1481. J. Harrison and C. Gelderd. Improvements in machines for warping and sizeing, or otherwise preparing yarns or threads for weaving.

1497. J. H. E. Mareschal. Improvements in hydraulic presses.

1505. D. Macdonald. Improvements in printing textile fabrics and other surfaces.

1517. E. Burnand. An improvement in the manufacture of fire-arms.

1570. T. Chandler. A lever cask stand.

1581. J. M. Letestu. Certain improvements in extracting liquids and solid or pasty matters.

1609. A. V. Newton. An improved fountain pen. A communication.

1715. E. Leak. A thimble pillar with points and branches, to be used in placing "glost" china and earthenware in ovens and kilns, when firing, burning, or baking such ware, in lieu of the cockspurs and stilts now in use for that purpose.

1726. S. Statham and E. O. W. Whitehouse. An improvement in the arrangements for, or working of, electric telegraphs.

1993. S. Jay and G. Smith. An improved "facing" or covering to be attached to the outside of ladies' dresses, mantles, or other articles of attire, peculiarly adapted for the warmth and protection of the chest.

2093. F. M. Herring. Improvements in applying magnetic action to combs and brushes.

2165. G. T. Bousfield. Improvements in power looms for weaving wire cloth. A communication.

2217. T. E. Blackwell. An improved mode of constructing fire-flues and air-passages.

2229. R. Husband. Certain improvements in the manufacture of silk hats.

2243. T. Holmes and T. Aspinall. Improvements in preventing or diminishing the production of smoke in fire-places and furnaces, and for effecting its combustion.

2257. C. Renshaw. Improvements in squeezing rollers applicable to machinery or apparatus for pressing or partially drying yarns and woven fabrics.

2264. J. Boyd. Improvements in letter-press printing machines.

2267. F. Ransome. Improvements in the manufacture of artificial stone, and in rendering it and other building materials less liable to decay.

2317. W. Johnson. Improvements in the treatment, preparation, or manufacture of sheet caoutchouc and in the combination thereof with cloth and other fabrics. A communication.

2328. A. V. Newton. Improvements in supplying steam-boilers with water. A communication.

2352. F. Whitehead. A method of, and apparatus for, producing devices in or on wood, leather, and other similar surfaces, whether for ornamenting the same or for the production of printing and embossing surfaces therefrom.

2360. H. Watson and J. Dixon. Improvements in cocks and valves.

2364. T. King. An improved continuous compressing machine.

2366. G. H. Cottam and H. R. Cottam. An improvement in the manufacture of iron hurdles.

2378. F. A. Gatty. Certain improvements in dyeing.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1853.

2463. Alfred Vincent Newton.
2466. Charles Goodyear.
2473. Edward Joseph Hughes.
2476. Patrick Benignus O'Neill.
2486. George Edward Dering.
2493. Joseph Gurney.
2526. John Whitehead and Thomas Whitehead.
2544. James Howard.
2587. Alfred Vincent Newton.
2610. Edward Gregson Banner.

LIST OF SEALED PATENTS.

Sealed October 24, 1856.

1856.

980. Alexander Southwood Stocker.
981. Abel Désiré Schratz.
1000. Edmund Topham.
1034. Richard Archibald Brooman.
1037. Augustus Smith.
1058. Isaac Holden.
1068. Richard Archibald Brooman.
1083. Conrad William Finzel, William Needham, and John Barton.
1084. Richard Archibald Brooman.
1085. Alexander Alliott.
1102. Richard Archibald Brooman.
1103. Richard Archibald Brooman.
1104. Frederick Richard Laurence.
1185. John Wilkes, Thomas Wilkes, and Gilbert Wilkes.
1206. Alexander Allan and Thomas Hunt.
1258. William Edward Newton.
1368. John Henry Johnson.
1498. James Platt and John Whitehead.
1530. Samuel Jabez Goode.
1572. Robert Luke Howard.
1868. John Woodman.
1958. George James Farmer.

Sealed October 28, 1856.

1011. William Denny Ruck.
1015. Thomas Greenshields.
1018. Isaac Abraham Boss.
1024. Joseph Rigby.
1025. Louis Jean Baptiste Manery.
1026. Wright Jones.
1038. Samuel Hunter.
1044. Alexander Gordon.
1050. Peter Armand Lecomte de Fontainemoreau.
1060. William Gregory.
1363. Charles William Siemens.
1404. Servans de Jong.
1615. David Fisher.
1711. William Papineau.
1873. Diederich Fehrman.
1903. William Morgan.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

J. A. D. Cog-wheel arrangements are never well adapted for steering apparatus, in consequence of the shocks to which the rudder is often subjected by the sea.

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LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, *in the City of London*.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, *Dublin*; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1735.] SATURDAY, NOVEMBER 8, 1856. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

BURNETT'S IMPROVED CRANES.

Fig. 1.

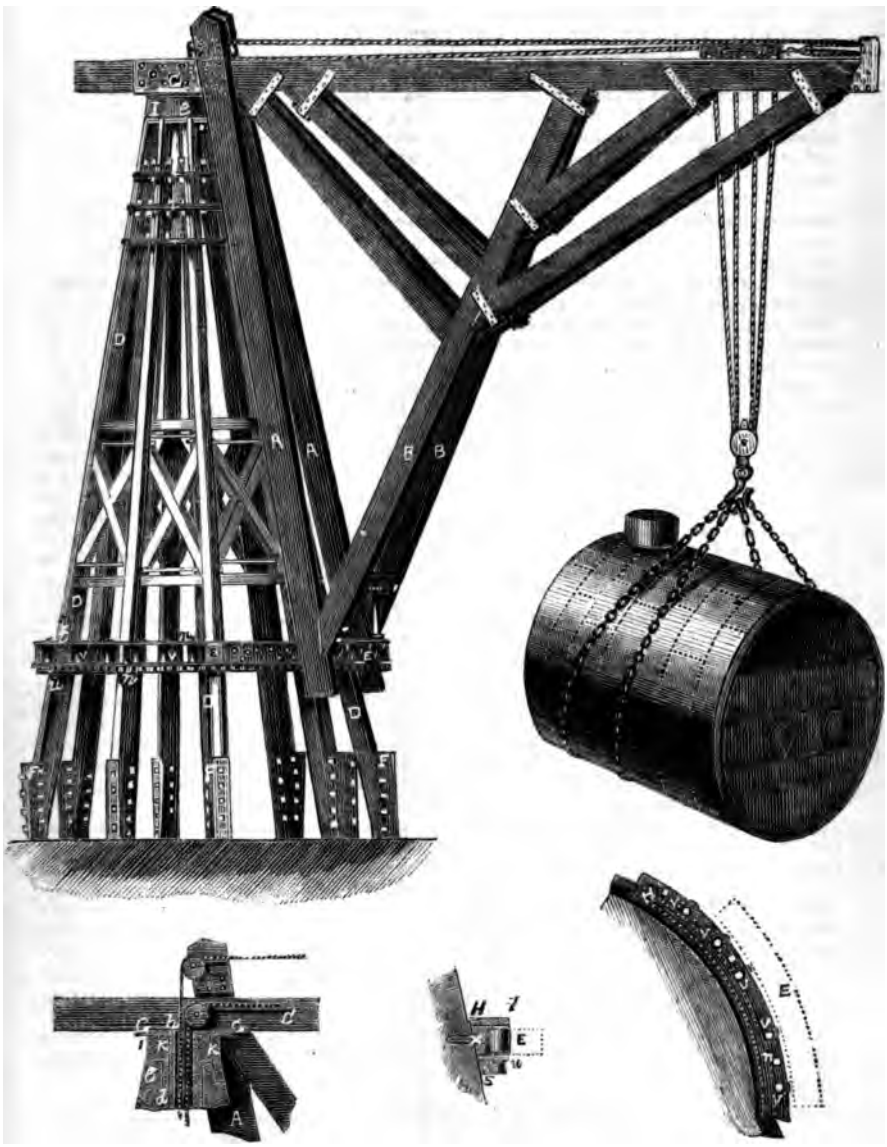


Fig. 2.

Fig. 4.

Fig. 3.

BURNETT'S IMPROVED CRANES.

Mr. B. J. Burnett, of the Novelty Ironworks, New York, U. S., has patented in America and in this country certain improvements in the construction of cranes, whereby they are rendered suitable for lifting, lowering, or moving about with facility and despatch heavy weights or articles, such as the bed plates of large marine engines, and for the performance of such heavy work as is generally performed by shears or a derrick, of which the former is for many reasons inconvenient, and the latter of complicated construction, and very liable to accident or breakage, owing to the large number of parts of which it is generally formed, and the difficulty of arranging the parts so that the strain shall be distributed properly throughout. In the improved cranes the jib with its immediate accompaniments and its load are borne vertically on the top of the stationary post or tower exclusively. This is not, however, a novel feature. The improvements consist, firstly, in the employment, in connection with the jib, thus supported, of a pendent segmental traveller or foot piece, to work round the lower part of the stationary post, pillar, or tower as the jib is turned, and to support the outer portion of the jib, and braced against lateral displacement. A second improvement consists in a certain arrangement of an antifriction roller frame in combination with the segmental traveller or foot piece, to reduce the friction and prevent the binding of the segmental traveller or foot piece against the post, pillar, or tower.

In the accompanying engravings fig. 1 represents the improved crane in elevation; fig. 2 is a central section of the journal and cap at the top of the tower, by which the whole vertical pressure or weight of the jib and the load are received; fig. 3 is a plan of a portion of the antifriction roller frame, against which the segmental traveller or foot piece works; and fig. 4 is a vertical section of the same. In this arrangement it will be seen that a strong polygonal pyramidal tower or framework, D D, of timber, erected upon posts or piles, F F, sunk in the ground, is used in place of the ordinary vertical post. The jib, C, with its several braces and parts, as will be hereinafter explained, is supported horizontally on the top of this tower by means of a cast-iron or other metal cap, I (figs. 1 and 2), formed with a sleeve, *d* (fig. 2), flange, *e*, and groove, *k*, the whole of which may be termed the "sleeve-cap," seated and secured firmly on the top of the tower, and receiving the "sleeve journal," *i*, which forms one part with a plate, G, secured to the jib. This plate rests on the top of the sleeve cap, and is provided with an annular tongue or projection, *h*, to enter the groove, *k*, in the sleeve cap. The sleeve journal, *i*, is made hollow for the crane-rope or chain to pass through it to the barrel, which with its gearing may be arranged within the tower, and may be operated by human labour, horse power, or steam power. The barrel and gearing are not represented, as they do not differ from those of other cranes. To secure the full advantage without restriction of any kind or extent of supporting the crane exclusively on the tops of the tower, and prevent the tendency to trip out sideways of what is known as the horizontal traveller, which, in cranes of this kind is used at the bottom of the jib, the inventor deems it advisable to restrict the horizontal traveller, E, to occupy only a segment of a circle, and not to extend all round the tower, so that there shall be no binding or twisting of it, and freely to suspend the "segmental traveller" from the jib, C, by connecting it therewith by main braces, B B, and backstays, A A, both or all of which, that is to say, the two or more pieces or timbers making up the duplicate main braces or backstays are arranged to spread outward or apart from the jib downward, as shown in fig. 1, so as to perfectly balance the said segmental traveller, E, as well as suspend it at their feet or lowest and widest spread ends, by which means all tripping out sideways, or tendency to do so, of the horizontal traveller is prevented, while its free suspension from the top of the tower, and exemption from all vertical or lateral binding is secured.

Having secured the above desiderata, the next point to be observed, in order to secure an easy and steady operation of the jib, is to provide for the lateral or horizontal strain or pressure of the foot of the crane, which in this case is the segmental traveller, E, which should occupy a position not far from the base of the tower. To get an easy run of this traveller horizontally in swinging the jib and its load, without interfering with the balance and free suspension of the traveller from the top of the tower by the spreading main braces, B B, and backstays, A A, as specified, and with exemption from all vertical binding of the traveller, would appear to be easily obtained by causing the traveller to rest against and work around a circle of vertical antifriction rollers, arranged to run freely on their axes, but otherwise stationary, as is common to lower crane post journals. But antifriction rollers thus arranged, or what is equivalent, hung in the traveller and bearing against the post or tower, are inapplicable to cranes having very heavy work to perform, the journals of the rollers, though made as stout as practicable to insure an easy run, being so liable to get bent, thereby interfering with the run of the rollers, and in some instances *being actually* crushed and broken by the excessive horizontal pressure thrown upon them

by the jib and its load. To obviate this difficulty, Mr. Burnett employs in connection with the segmental traveller, E, the horizontal circular revolving frame, H, of vertical rollers, *v*, arranged as follows:—The circular revolving frame, H, is made of two rings, *t* and *u*, horizontally parallel with each other, and connected together by stays, *s* (see figs. 1 and 3). These rings encircle the tower, as shown in fig. 1, and the upper ring, *t*, which is of smaller internal diameter than the lower ring, rests upon a circular way, *x* (fig. 4), built in, on, or around the tower, so that the whole weight of the circular frame, H, with its vertical rollers, *v*, *v*, arranged within and around it, is carried by the upper ring resting on the tower. This circular frame of rollers is loosely seated on the tower, but is backed, as it were, though the parts are distinct from each other, by a ring or band of iron, *x* (fig. 4), spiked or otherwise secured to and round the tower between the rings, *t* and *u*. This ring or band, *x*, serves as an inner surface for the rollers, *v*, *v*, to bear against as the frame, H, is moved round the tower, the rollers, *v*, *v*, projecting beyond the rings, *t* and *u*, on the outer periphery of the circular travelling frame, H, and the segmental traveller pressing on the outside against the rollers, *v*. Now it will be obvious that by this arrangement all horizontal pressure of the jib and its load is borne by the bodies of the rollers on or against the stationary ring or band, *x*, which encircles the tower, and none of it is borne by the journals of the rollers, which therefore preserve their true run, as all bending or crushing of the journals is avoided.

In swinging round the jib with its load, the segmental traveller, E, rubs against the rollers, *v*, on the outside, and in turning them causes them to bite on or against the stationary metal ring or band, *x*, and so to carry round the whole circular frame, H, by the creeping of the rollers round the stationary band, *x*, while all vertical pressure at the foot of the main braces, which support the jib, is transferred by the backstays, A A, to the top of the tower, and in no way affects the easy run of the circular frame, H, which has only to carry its own weight and that of the rollers. The swinging round of the crane may be accomplished by means of a stationary spur-toothed ring, S, all round the tower, and any suitable arrangement of gearing attached to the jib, or otherwise, in any suitable manner.

In some cases the improved crane is erected upon a floating platform, so that it may be floated from place to place, placed alongside steamers, &c.

THE "MERRIMAC."

THE following "Notes" were written by a naval gentleman, who, in consequence of absence from the country, had not, at the time of writing them, seen our article upon "The New American Steam Ships of War," notwithstanding its reproduction in the *Times*, and other morning papers. It was not until the receipt of our monthly part on Monday last that he became aware of what had already been written respecting the *Merrimac*. As his remarks, however, contain references to many points which we purposely refrained from mentioning, and as they present the views of a person very competent to discuss them, we have much pleasure in giving place to them here. It will be seen that in some minor instances the opinion of our correspondent is, more or less, at variance with our own, and he occasionally speaks with less favour than ourselves of what he observed, but we do not wish on that account to withhold his testimony.

One remark of our correspondent, which has reference to the large class ships of our own service, has reminded us of the unnecessary secresy, or rather the unnecessary pretence of secresy, made by our Admiralty authorities respecting the dimensions, &c., of the vessels of our own navy. If the Admiralty really could and would exclude all but themselves and their subordinates in the various dockyards from a knowledge of these matters, there would be some reason in their apparent avoidance of publicity. But as a matter of fact, what they really do, if at all successful in their endeavours, is, they exclude *the British public only* from such knowledge. We have not the smallest doubt that the Czar of Russia, or the Emperor of Austria, or the President of America either has, or could obtain without difficulty, both the dimensions and the conditions of all the ships in existence and in course of construction in the British navy; and if not, we could acquaint any of them with a hundred methods by which the informa-

tion is obtainable. Why then should there be any official attempt to conceal such information from the journals of this country? For our own part, we can well afford to smile at every endeavour to conceal from the press any fact which is to be learnt directly or indirectly in a dockyard, and the Admiralty have, therefore, but two courses before them; they may either themselves make public from time to time the information in question, or trust to our discretion and pleasure for its concealment.

NOTES OF A VISIT TO THE UNITED STATES' FRIGATE "MERRIMAC." BY A NAVAL OFFICER.

THE *Merrimac* is certainly a fine frigate, although I consider that an undue amount of praise has been lavished upon her by the public papers. On the occasion of my visit to her they were expecting a visit from a high naval officer,* and the ship was "got up" for the purpose. The upper decks were well holystoned, bright-work all well polished, &c.; but still it did not impress me with the idea that she was perfect in respect to cleanliness. There is a great deal of "bright-work" about her—large brass awning or hood stanchions over every hatchway; all these were highly polished, together with the brass guns for the boats, elevating-screws of guns, &c.

The appearance of the crew was anything but creditable; although past seven bells, the men were not uniformly "clean." We saw several with long boots on, and their trowsers tucked inside, very unlike the appearance of the men on board a British man-of-war. The *head* decidedly was not kept as clean as it should be; the smell in the forecastle from it was most offensive.

The guns were nicely polished, and generally appeared well kept; they are fitted with elevating-screws, the fitness of which for long guns is questionable. In short pieces, such as carronades, where the circle described by the breech in elevating or depressing is not much, the slow effect of the screw is more sensibly felt than in the larger circle described by the long gun; hence the pointing of the gun must take longer than with the handspike and quoin. The carriages are on the French plan, without trucks on the after part, and worked by roller handspikes. There is no question but that on this plan the shock of recoil is more severely felt than when the gun recedes more easily under its force. The sponges are made of brush bristles instead of wool, as in our ships. This is a great improvement. The locks of the guns are on the hammer principle, with back-spring action, but not so simple as those used in the British Navy. The breechings are fitted with solid or shackle-eye thimbles for drop bolts, instead of thimbled-eye thimbles, as we use. It makes the breeching stand up stiffer to its work. The boats' guns are all of brass, and, for land service, are mounted on three-wheeled iron hand carriages. They did not appear more suitable for service mounted this way than if on regular land carriages. The muskets are all rifled on the Minié principle; we found, however, the locks very stiff and hard, and not suitable for precise firing. The best of shots could not ensure a good shot with one of them. The pistols are upon the common percussion plan. Upon inquiry, it appeared that there are not any revolvers amongst the public armament. The cutlasses appeared short. The guns are more swelled at the breech than our ordnance. The armament of the main-deck battery consisted of 9-inch guns; the upper deck, 8-inch, and two 10-inch pivot guns, one on the forecastle and one on the quarter-deck (40 in all); the bulwarks being made to fall down to work these guns. We could not see the arrangement of the magazines and shell-rooms; but it struck us that the light-room of the fore magazine was insecure, a very light door only separating it from the gunner's storeroom.

The main deck is low, and disappointed us; from the capacity of the ship, a finer gun-deck might have been expected. The employment of wooden knees, instead of iron, also gives a clumsy appearance to the deck; this old-fashioned mode of construction is remarkable. A very noticeable thing was the abundance of large hatchways and ladders, a very good thing in a ship of war.

The lower deck is good, but the absence of mess-tables gives it an uncomfortable appearance. The men take their meals on the deck; this is greatly to be reprobated in a ship of her size. Nothing contributes so much to the moral condition of a ship's company as their social comfort. The clean mess-table on board of an English man-of-war, with the mess-traps all nicely arranged on the shelves at the ship's side, is a great comfort to the men; and it is pleasant to observe the men sitting at their tables of an evening, reading perhaps to each other, or enjoying the yarn of some gifted messmate. It is true that in many small English men-of-war the mess-tables are not used, but in large vessels this is never the case, and in frigates especially the mess-tables can never be objected to,

* The Commander-in-Chief of Portsmouth, Sir George Seymour.

as they are not interfered with in time of action.

The engines are on the double piston rod principle, and direct action; they are much pinched up, and many of the parts most difficult to get at. The "screw alley," or "shaft-way" is formed of boiler plate, arched at the top, and waterproof. The screw is on Griffith's principle. The spare fans were stowed on the lower deck. There was nothing remarkable aloft, except that there were a kind of standing rolling tackles, or more properly preventer lifts, on the lower yards. There was a very excellent contrivance on the forecastle for fishing the anchor. It consisted of a stout spar, one end fixed to a swivel bolt on a band round the foremast, the other end fitted with a hoop with four eyes. When used, a pendant from the lower mast aloft is hooked to the upper eye, and guys to the eyes on each side. The spar is then topped up and canted over to the side required, the fish tackle block hooking to the eyebolt on the under side of the hoop. By this arrangement the fish davit is rigged in an instant, and is always ready for use. When not required it lies fore and aft on a crutch.

The appearance of the *Merrimac* outside is not favourable. She has a considerable amount of sheer, and her stern is very heavy. Her bow is good. She does not look as if she were a fast ship, although the officers assured us that she was so.

To conclude, sufficient desire is indicated in the great size of the *Merrimac*, on the part of the United States, to exceed us in the size and weight of their frigates, to suggest to our Government the necessity of increasing very considerably the dimensions of this kind of ship of war. Whether the *Shannon*, our largest frigate, is a faster ship than the *Merrimac*—whether she carries more guns, and will be more efficient in her armament—is another thing. The fact of the *Merrimac* being a *thousand* tons larger than she is, is sufficient to arouse the attention of the naval surveyors to the necessity of building even larger frigates than the *Shannon*, if we do not wish, in the event of another American war—which God forbid—to have similar disasters to those which marked the naval proceedings in the last war; for it must be remembered that, as far as size is considered, there is a greater contrast between the *Shannon* and *Merrimac* than between the *Guerrière* and *Constitution*.

A very large proportion of the crew of the *Merrimac*, I may add, are English seamen, and many of them served in the Baltic and Black Sea fleets.

MR. BESSEMER'S DISCOVERY.

SUFFICIENT time has now elapsed since the reading of Mr. Bessemer's paper at Cheltenham, to enable the American manufacturers and others to express their opinions of the novelty and merit of his process. Accordingly, we find in the number of the *Scientific American* last received (for Oct. 18) three communications upon the subject.

The first is from Mr. W. Kelly, of the Suwanne Iron Works, Kentucky, who states that in Nov., 1851, he commenced a series of experiments with a view of converting fluid pig metal into malleable iron, with the aid of a strong blast of air, and without the use of fuel, which process he termed "air boiling." He states that his first efforts were quite satisfactory, and that his experiments were publicly conducted at the above-named establishment, were witnessed by hundreds, and discussed by iron masters, &c. He further states that Mr. Bessemer's process does not differ "in the slightest" from his own, and adds that a number of English puddlers visited his place, examined his invention, and returned to England three or four years ago.

The second communication is from J. G. Miner, of Mott Haven, New York, who first states that iron and steel do not depend for excellence of quality upon perfect or approximate purity, but upon the quality of the ore and fuel used in its first production in the blast furnace. He then expresses disfavour of the very elevated temperature obtained by Mr. Bessemer in the latter part of his operation, and remarks that "the lower the temperature that crude is worked at, the better will be the quality of the wrought iron produced." He further states that Mr. Bessemer's is but crystalline, and not fibrous metal, and that it cannot be hammered or rolled sufficiently to produce any fibre in it.

The third article is editorial, and after mentioning the unsatisfactory results obtained by the experiments of a leading American iron-master, assisted by a distinguished chemist, concludes thus: "The most carefully performed experiments on this side of the Atlantic have utterly failed to produce *fibrous iron*, and the specimens sent over from England as fibrous iron, do not, upon examination, possess this character."

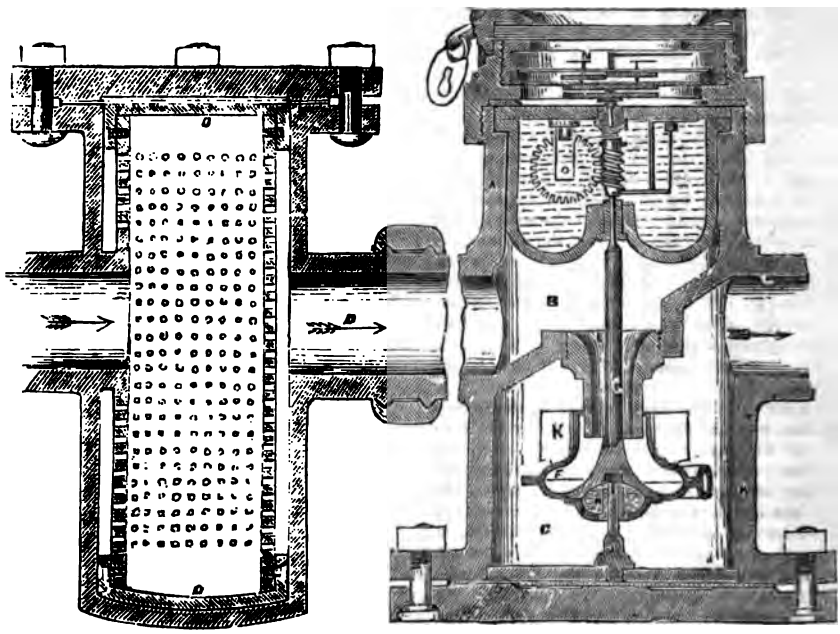
SIEMEN'S IMPROVED WATER METER.

In January, 1854, Mr. C. W. Siemens communicated to the Institution of Mechanical Engineers a paper on an improved water meter, in which he described several mechanical arrangements, by which he had succeeded in measuring water flowing through pipes with a sufficient degree of accuracy for practical purposes, and without destroying the pressure or head of water column. In the course of considerable experience with these meters, several important improvements have suggested themselves, and opportunities have occurred of observing the public importance of supplying water by meters, which Mr. Siemens has recently laid before the members of this institution.

The chief difficulty that presented itself in endeavouring to produce a practically perfect high pressure meter was not so much to obtain a correct measurement under varying circumstances of pressure, as to render the instrument sufficiently durable to resist for years the action of the water and of the impurities carried along with it. It was found necessary to protect all the working parts against the chemical action of the water, to prevent deposit of calcareous matter upon the measuring apparatus, and to combine strength with lightness as far as possible in the construction of the movable parts, in order that they might resist the force of a high water column, and might yet be moved by the slender stream produced by a leaky tap, which in the case of the smaller meters may not exceed half a pint of water passing through per minute. Cheapness and compactness of construction were other important considerations not to be lost sight of.

The improved meter, as at present manufactured by Messrs. Guest and Chrimes, is represented one quarter full size in figs. 1, 2, and 3, which are respectively a section of the meter, a filtering chamber, a perspective view of the drum, and a plan of the drum, the engraving, description, and following remarks being taken from the Report of the Proceedings of the Institution. The meter consists of a cast-iron casing, A, fig. 1, divided by a partition into two compartments, B and C. The water entering

Fig. 1.

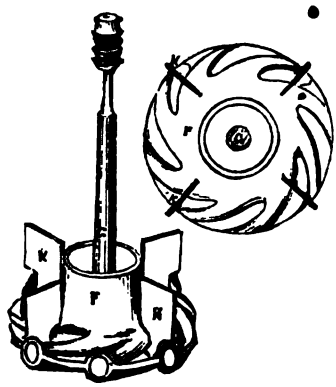


the compartment, B, through the pipe, D, passes through a spout, E, into a revolving drum, F. The drum, F, shown in the perspective view, fig. 2, and the plan, fig. 3, is formed of two stamped disks of brass plate rivetted and soldered together face to face, each part containing similar spiral grooves or corrugations forming channels for the water to pass from the centre to the circumference. The foot of the spindle, G, forms

with the lower portion of the drum a chamber, H, into which enters a fixed stud, J. The point of the stud is of hard steel, and works in contact with a bit of hardened steel let into the bottom of the spindle, G, forming a support for the drum, F. The chamber, H, is filled with oil to protect the bearing from the action of the water, and the oil being the lighter fluid cannot be displaced by the water. The drum, F, carries three or more flat blades, K K, intended to produce a resistance in the water increasing as the square of the velocity of revolution, the effect of which is that the drum, which has a tendency to revolve at a rate increasing more rapidly than the velocity of the water, is caused to rotate at a speed proportionate to the quantity of water passing through, whether at a high or low velocity.

The water having issued into the chamber, C, passes away by the pipe, L, to the point of delivery. The spindle, G, passes upward into the chamber, M, which contains wheelwork to reduce the motion communicated by the drum, and is also filled with oil. A small spindle passes finally at

Fig. 2. Fig. 3.



a greatly-reduced speed through a stuffing-box into the upper chamber, N, containing the dial on which the quantity of water that has passed through the meter is indicated by hands in gallons or cubic feet. The details of the counting apparatus have been described in the former paper. The cup or dish forming the chamber, M, is made of stamped brass and corrugated, in order to yield to concussions from the water.

Before entering the meter, the water has to pass through a grating, O, which arrests any solid matter, and is made easily accessible for the purpose of removing from time to time the impurities that have collected, when it is found that the passage of the water is obstructed.

It is important to make the area of the inlet, E, nearly equal to the collective area of the outlets of the drum, F, but a little smaller than the latter. If the area of the inlet were made larger than that of the outlets, there would be a greater pressure within the drum than in the surrounding chamber, C, and some water would escape unmeasured between the neck of the drum and the outside of the inlet, E; on the other hand, if the area of the inlet were made considerably smaller than that of the outlets, a leakage would take place from the chamber, C, into the drum, because the water passing through E would act in the manner of a blast, as in Mr. James Thompson's jet pump. The area of the inlet should accordingly be, for the smaller meters, 10 per cent., and for the larger 5 per cent. less than that of the outlets, to allow for loss of velocity by friction in the drum. This loss may be taken to represent with tolerable accuracy the degree of obstruction opposed by the meter to the moving water column. The rapid current of the water through the inlet, E, and the curvilinear channels of the drum have been found to prevent deposit of calcareous matter in these places, which is an important point; for were it otherwise, the meter would gain in relative speed in proportion as the area of the channels was diminished.

Meters constructed on this plan have now been found to work continuously for nearly three years under the most varied circumstances, without requiring any alteration whatever. The arrangement made between the manufacturers and the water companies or purchasers of the meters is, that every meter that fails to give satisfaction, in consequence of stoppage or inaccuracy of measurement, shall be exchanged; and experience shows that the number of meters so returned does not exceed 2¼ per cent. in the year, and these for the most part have been sent back only from trivial causes. The manufacturers enter into contracts to maintain the meters supplied by them in good working condition for a term of years, in consideration of the moderate annual charge of 5 per cent. per annum on the first cost, proving thereby their own confidence in the durability of the meters.

MEAKIN'S PATENT DOMESTIC FIRE-ESCAPE.

On Monday last, an exhibition (of which notice had been given by public advertisement) of Meakin's Patent Fire-escape, took place in Bridge-street, Blackfriars.

The apparatus consisted of two wire ropes affixed to strong iron hooks in the front wall, just over one of the third floor win-

dows; a cradle furnished with two pulleys was rapidly raised and lowered from the upper window, sometimes loaded with a *boy*, by the funicular power of the divergent ropes, the lower ends of which were drawn asunder by five men to each. It is but justice to say the apparatus worked well when once got into operation, but the time taken up in removing the sashes (!) and other preliminary preparations, had an unfavourable effect upon the spectators.

We recognised in this apparatus a very *old* friend, and with a not very new face. The diverging rope fire-escape, we remember, was originally invented by Mr. David Davies, of Wigmore-street, and first exhibited by him at a public meeting in Aldermanbury in February, 1829, as described at page 101 of our 11th vol. Many other public exhibitions were subsequently made by Mr. Davies, the most notable being his descent from the steeple of St. Botolph, Bishopsgate. A correspondent (Mr. J. Oliffe)* suggested an improvement, by spacing out the upper end of the ropes, thereby increasing the funicular power, so as to make the descent more uniform, and to enable a person to be sent up, as well as brought down by the apparatus. Some years afterwards, a Mr. Thompson still further improved this apparatus, by substituting two pulleys on the belt, for the ring or thimble employed by Mr. Davies. The late Mr. Wyvill tried the divergent rope escape, but did not find its working satisfactory, and eventually abandoned it.

Mr. Meakin's present invention combines all the previous improvements, only substituting a *cradle* for the *belt!*

Happily the metropolis is now so thickly studded with public fire escapes, in charge of well-trained conductors, that domestic fire escapes have become of very secondary importance. The present number of the Royal Society's fire-escape stations is forty-six, and it is stated that nearly seven out of every ten persons extricated from burning buildings by these intrepid men, are in a state of perfect helplessness, either from the effects of sleep, smoke, or fright. This fact sadly detracts from the probable usefulness of any invention which requires the smallest possible (even preliminary) preparation on the part of the jeopardised inmates.

In places destitute of public fire escapes, however, it would be well to provide private ones, and there have been many domestic fire escapes described in our past volumes, which will, we think, be found cheaper, simpler, and more easily worked than the divergent rope escape, even in its best form. That of Mr. Merryweather (vol. xxxiii., page 454) may be instanced; it can be worked by one person either above or below, or even by the party descending, while the divergent ropes require ten or twelve persons, with some knowledge of their working.

* *Mech. Mag.* vol. xi., p. 147.

ASTRONOMICAL EXPEDITION TO THE PEAK OF TENERIFFE.

(*Concluded from page* 388.)

Closely connected with radiation is the quantity of the light emitted by the heavenly bodies, and this was examined frequently in the case of the sun and moon and different parts of the sky by observations of Frauenhofer's lines in the spectrum. Stoke's spectrum was also examined, as recommended by the Royal Society, and was found to be traceable beyond the furthest point previously ascertained elsewhere. Means of photographing this spectrum were also prepared, and some pictures of it, on glass, obtained, showing many of the dark lines beyond H, the usual limit of vision.

Several hundred measures of the polarization of the sky-light were likewise obtained, and the zodiacal light, and twilight were frequently made the subject of numerical observation; continual registers of the barometer, dry and wet bulb thermometer, and the electrometer, being kept up during the whole of the time.

The geology of the peak could be well examined from this point, and offered much of exceeding interest, as did also the magnetism and botany of the neighbourhood, while the remarkable moderation of the wind, considering that it was a mountain top, allowed researches to be carried on without let or hindrance throughout the twenty-four hours.

On the whole, therefore, Guajara approved itself admirably as a station for ascertaining the astronomical qualities of the atmosphere at the height of 8,870 feet; but still, Professor Smyth could easily see that he had by no means reached the *ne plus ultrà*, and might evidently effect even far greater improvement by rising yet higher above the atmospheric impurities that linger about the surface of the earth. "Raised we were," he says, "far above the level of the actual cloud of the N. E. wind, but we were not always above the wind itself; and even, as this rose and predominated over the station, so did telescopic definition become bad. We were also more frequently than otherwise enveloped in a dusty, smoky sort of medium, whose vast strata, piled one on the other and stretching out to the distant horizon, rose some thousands of feet above our heads, and only the peak itself seemed high enough to be fairly above these upper mists. To the peak,

re, it was evident we must go to reap astronomical advantages which Te- is capable of yielding."

peak, however, was not so simple a to reach as the first station, for the ıot accessible on account of the con- evolution of sulphurous vapours, ı considerable portion of the slope t is impracticable on account of the lava streams by which it is covered. me also being short, while himself ɔserving at Guajara, the Professor en to explore the ascent, to ascertain hest available station, and to build lls of a scientific encampment, ac- ; to a plan furnished them. Then, 28th of August, the party moved th all the instruments mounted on a twenty-seven horses and mules; and day's hard work, toiling through the stone soil and rugged lavas of the ıter, and after a long steep climb, ed before night their new position of a Vista. "Perched on the top of a f pumice and red lava on the south- ope of the Peak, at an elevation of feet, the Alta Vista forms," says ior Smyth, "a comfortable little tolerably level, and is the highest ıccessible to mules. On no other n they ascend so high, by reason of rents of black lava blocks, which over the flanks of the mountain, but have in this case curiously divided, t a narrow and steep roadway of the ock between two embankments of the scoria. These ridges, rising to the of about thirty degrees, served ad- r to protect us from the winds to- the S.W. and N., and, if they did e with the ruder eye observations of henomenon near the horizon, they uted to the advantage of telescopic tions with high magnifying powers l to the zenith. Here, therefore, e place where the great Pattinson ial must be erected, if at all."

he 25th of August, after the elevation instrument had been pronounced by nds as hopeless, the indefatigable or, leaving the men to roof-in the built walls, descended the mountain hat could be done in carrying it up. strument, with an object glass of 7¼ aperture and 12 feet focus, and with atorial mounting entirely in metal, the first class of finish and perfection, ordance with the requirements of astronomy, had been taken to pieces naker in England, as far as he had t safe or practicable for its re-erec- a mountain side, far from the re- of workshops. But as he had not l it to its primitive elementary parts, the unwieldier masses could still be subdi- vided and packed up into smaller parcels. To this, therefore, Professor Smyth applied himself, and, assisted by an ingenious me- chanic of the place, separated, and finally packed in 13 boxes what had been arranged by the maker in three. Then starting from the town at daylight on the 30th of August, with 11 horses and men, the whole of the cases were taken up to the Alta Vista by sunset the same evening. On the second day, notwithstanding a storm of wind and sand which raged for the two days, the com- plete equatorial with clock motion, axes well adjusted, and verniers reading off accurate places on finely-divided circles, was in full operation, the first time that such a thing had ever taken place so high above the level of the sea.

But now only a fortnight of the prescribed time remained, and there were marked in- dications of a premature breaking up of the fine season. Professor Smyth set to work, therefore, without loss of time to determine, in the first place, the degree of definition in the atmosphere; for very grave fears had been thrown out that the hot vapours from the Peak would be utterly fatal to telescopic vision. The definition, however, proved admirable; so much so, that not only once, but every night for a week, he could see that difficult test B and C of γ Andromedæ as two distinct stars; nor could he find any object in the lists of the "Cycle" that were not separated by the telescope, and with ease.

Equally with regard to the range or visi- bility did the atmosphere approve itself; for the very faintest star to the practised eye and powerful telescope of the observer of the "Cycle" proved easy to even an inexperienced person in the Pattinson equatorial.

Directing them to planetary bodies, the fine division of Saturn's ring—a much con- tested matter—came out unmistakably, and revelations of clouds appeared on Jupiter's surface which were eminently similar in form, and as continually inter- esting in their changes as those of the sea of lower clouds brought about Teneriffe daily under their eyes by the N.E. trade wind. Of the moon some extraordinary views were obtained, notwithstanding its unfortunately low altitude at that time, and the sun was observed both optically and photographically.

Daily, however, the weather, which had been in a manner disjointed by the storm on the 1st, was becoming worse; and the wind continually increasing, now began to shake the telescope so as to prevent the employment of high magnifying powers. Then the sky became cloudy; and at last,

on the 14th of September, the storm broke in earnest, beginning with a rattling fall of hail.

"That night," says Professor Smith, "above two inches of rain fell, and the climate altered so much that the natives would no longer remain with us. But the temperature was by no means unbearable to Northern men, and the sailors from Mr. Stephenson's yacht, proving good men and true, I still hoped to be able to see out the last of the clouds, and to finish several series of observations which had been interfered with by them. The break up of the summer weather had, however, been too complete, and though we stayed till the last possible day, we never saw the clear sky again; so, on the 19th, we dismantled the buildings, made a *caché* of such materials as might be useful in a future year, and went down to Orotava with the instruments and baggage."

During the Alta Vista period of these experimental labours, the smaller instruments before employed at Guajara were again in action; an improved method of observing the black lines in the spectrum was devised; some meteorological ascents and descents of the mountain were made, according to the suggestions of the Royal Society; and Humboldt's horizontal fluctuation of the stars, and the nature of the ice cavern, as recommended by Sir J. Herschel, were examined into. The crater of the Peak, the Montana Blanca, and various places remarkable for their geology or botany, were visited with hypsometric instruments, and with a photographic camera, by the aid of which about 200 pictures were obtained.

Finally, in concert with a Spanish gentleman of great local knowledge (Don Martin Rodriguez, of Cegas), the Professor examined the upper part of the mountain, and found a station that, with a little expense, might be made available for another year, and besides greater height, would possess some other advantages over either the Alta Vista or Guajara. Arrived in Orotava, he employed himself for a week in settling the accounts, in examining the zeros of his meteorological instruments, and in photographing and measuring some remarkable volcanic features in the neighbourhood, and also the great dragon tree, as recommended by Sir John Herschel. Then on the 26th of September he rode over to Santa Cruz, and having examined the tide gauge which, with the assistance of Mr. Hamilton and the warm co-operation of the Spanish engineers, he had had constructed on the mole to meet the wishes of the Master of Trinity College, Cambridge, he embarked on board the yacht *Titania* the same evening. The captain immediately set sail, called off Orotava the next day, September 27, for the instruments and baggage, and has now safely brought them back to England after an absence of 117 days. Of these 36 have been spent at sea, 18 in the low lands of Teneriffe, 37 at the height of 8,870 feet, and 26 at the height of 10,900 feet.

TETLEY AND APPOLD'S CENTRIFUGAL PUMPS.

COURT OF COMMON PLEAS, GUILDHALL, OCTOBER 31ST, 1856.

Before Mr. Justice Willes and a Special Jury.

TETLEY *v.* EASTON AND AMOS.

MR. COLLIER and Mr. CHANCE appeared for the Plaintiff, and Mr. KNOWLES, Mr. HINDMARCH, and Mr. MACRORY for the Defendants.

This was an action for an alleged infringement of the Plaintiff's patent for "Improvements in machinery for raising and impelling water and other liquids," and the case had stood for trial at the sittings after last Trinity Term. In consequence, however, of the number of cases then to be tried, it was found impossible to try this cause before the Long Vacation, and the learned Judge arranged to sit to-day, so as to enable either party to take the opinion of the Court during Michaelmas Term upon any points which might arise at the trial.

By consent of the parties the jury were discharged, it having been agreed that the Judge should decide upon the question of fact as well as of law.

This case now came before a court of justice for the third time. On both the former trials the Plaintiff had failed in consequence of the claim in his specification being too extensive. By two disclaimers he had reduced his claim so that what he now contended for as his invention was, "the means of increasing the action of the machine by causing the liquid to enter the wheel at both sides."

On behalf of the Plaintiff it was urged that the great peculiarity of his pump was, the combination of an axle to be driven by steam or other power; a hollow wheel having within it a central disc, to which the axle is fixed; two side plates, with openings in their centres for the admission of water on both sides of the wheel, and a watertight joint between these side plates and the suction pipes; and that Appold's centrifugal pump, made by the Defendants, had each of these essential features.

On the part of the Defendants, evidence was given to show that in each of these par-

ticulars the Plaintiff's invention was not new, but that, as long ago as the year 1835, Mr. Hales had made, used, and sold pumps and propellers having each of these elements; and Hale's patents of 1830 and 1831, Clark's of 1833, and Ruthven's patent of 22nd March, 1841, were put in evidence.

Mr. Justice Willes said that the only thing which the Plaintiff's specification now claimed was, the causing the water to enter both sides of the wheel, and the question was, whether there was any novelty in that. Ruthven's pump plainly contains a wheel in which the water is admitted on both sides, and even although the wheel there was combined with apparatus which made the combination useless, nevertheless it was public property, and might be taken and used by any one, and be applied to any beneficial purpose.

The learned Judge was therefore of opinion that there was no novelty in the Plaintiff's claim, and that the patent was not valid; and he directed a verdict for the Defendants upon the material issues, with leave for the Plaintiff to move to enter a verdict for himself for £65, if the Court should be of opinion that the patent could be supported.

STEAM PILE-DRIVING MACHINERY.

Mr. Robert Morrison, of Newcastle-upon-Tyne, has patented a machine or apparatus for driving piles by the direct action of steam, by which two or more rows of piles may be driven simultaneously without the necessity for any lateral or transverse movement being imparted to the pile-driving mechanism, and consequently the expense of driving temporary piles and erecting platforms for the machine to traverse laterally upon from one row of piles to another is obviated. According to this invention one, two, or more steam cylinders and driving rams are employed, according to the number of rows of piles to be driven at one time, the distance between such cylinders and rams corresponding to the width between the centres of the rows of piles. The cylinders and valve gearing are carried in suitable supports on one end of a travelling carriage running on wheels, and a vertical tubular boiler and small steam-engine for hoisting the piles and raising the cylinders when they have each driven a pile, are carried at the other end of the carriage. The boiler is fitted with a conical or tapered fire-box, the contracted end being uppermost. As fast as each pile in a row is driven the machine *is traversed* forward between the rows to the next piles, and so on until the whole of the piles in each row are driven. The driving rams are made solid, and the pistons are forged or cast in one piece therewith. A stuffing box is fitted on to each end of the cylinders, and the driving rams work through both the stuffing boxes, which thus serve as guides without the necessity for any other means of steadying them during working. The lower end of the ram or that part which works through the lower stuffing box is made cylindrical, whilst the upper portion working through the top stuffing box is made square to prevent the ram from turning round. Or in place of making it square it may be first turned cylindrical, and then have one side planed off, or it may be simply fitted with a feather on one side; any other form, however, would answer other than cylindrical. The valves of the steam cylinders are so arranged that the steam may either be admitted on the underside only of the pistons for raising the rams, and then allowing such rams to fall by their own gravity to drive the piles, or the steam may be admitted on each side of the pistons so that the force of the blow may be increased in proportion to the pressure of the steam. In the former case the upper stuffing box will not, of course, require packing, but will merely serve as a guide to the ram. The small steam engine which it is proposed to employ for raising the cylinders after they have done their work, and hoisting fresh piles to deposit under the rams, is an inverted trunk engine, the lower end of the trunk being flattened to such an extent as will balance the weight of the piston trunks and connecting rod.

IRON STATISTICS.

Since 1785, 60,000,000 tons of pig iron have been made, and 45,000,000 tons used for making 30,000,000 tons of rolled iron, requiring 210,000,000 tons of coal, 135,000,000 tons of ironstone, and 27,000,000 tons of limestone, thus adding £12,000,000 sterling to the rentals of mineral owners, out of materials previously useless, and only made profitable by Henry Cort's inventions. In the words of Locke—"To any one who will seriously reflect on it, I suppose it will appear past doubt that, were the use of iron lost among us, we should in a few ages be unavoidably reduced to the wants and ignorance of the ancient savage Americans, whose natural endowments and provisions came no way short of those of the most flourishing and polite nations; so that he who first made known the use of that contemptible mineral (ironstone) may be truly styled the father of arts and author of plenty."—*Mining Journal.*

THE BRUSSELS' ECONOMIC EXHIBITION.

A very useful and interesting report upon the above Exhibition has been submitted to the Council of the Society of Arts, by T. Twining, Esq., junior, who so successfully exerted himself in promoting the undertaking. We regret that we have not space to give this report at length, since a mere abstract of it would be of but little service. It is, however, published in full in the last number of the "Journal of the Society of Arts." We are pleased to learn from Mr. Twining's Report that a permanent economic exhibition is to be established at Brussels. He says, after alluding to the obstructions met with in organizing the recent exhibition, "All these drawbacks, which are inherent to a temporary exhibition, will disappear in the permanent museum which I am happy to say my Brussels friends fully intend to establish, having obtained for that purpose a considerable portion of the articles displayed, secured provisional premises, and been assured of the most favourable feeling on the part of the authorities."

INSTITUTION OF CIVIL ENGINEERS.

THE Council of the Institution of Civil Engineers have awarded the following Premiums, for Papers read during the Session 1855—56.

1. A Telford Medal, and a Council Premium of Books, suitably bound and inscribed, to John Murray, M. Inst. C. E., for his paper "On the Progressive Construction of the Sunderland Docks."

2. A Telford Medal, to John Mortimer Heppel, M. Inst. C. E., for his paper "On the relative proportions of the top, bottom, and middle webs of Iron Girders and Tubes."

3. A Telford Medal, to Henry Robinson, Assoc. Inst. C. E., for his paper "On the Past and Present Condition of the River Thames."

4. A Telford Medal, to Charles Robert Drysdale, Assoc. Inst. C. E., for his paper "On Steep Gradients of Railways, and the Locomotives employed."

5. A Telford Medal, to Frederick M. Kelley (New York, U. S. America) for his paper "On the Junction of the Atlantic and Pacific Oceans, and the practicability of a Ship Canal, without Locks, by the Valley of the Atrato."

6. A Council Premium of Books, suitably bound and inscribed, to George Herbert, for his paper "On the Construction *of Buoys, Beacons*, and other Stationary *Floating Bodies*."

7. A Council Premium of Books, suitably bound and inscribed, to Evan Hopkins, for his paper "On the Vertical Structure of Primary Rocks, and the general character of their Gold-bearing Varieties."

8. A Council Premium of Books, suitably bound and inscribed, to William Heinke, for his paper "On Improvements in Diving Dresses and other Apparatus for Working under Water."

9. A Council Premium of Books, suitably bound and inscribed, to John Baillie (Vienna), for his paper "On the Application of Volute Springs to the Safety-valves of Locomotive and other Boilers."

10. A Council Premium of Books, suitably bound and inscribed, to William Kemble Hall (U. S. America), for his paper "On the Causes of the Explosions of Steam Boilers."

The first Meeting of the next Session will be held on Tuesday, November 11, when a paper by Mr. D. K. Clark, "On the Improvement of Locomotive Stock," will be read and discussed.

MARTIEN AND BESSEMER.

To the Editor of the Mechanics' Magazine.

SIR,—It is gratifying to know that the "refreshing verdure" of my remarks on Mr. Mushet's *rotation* has soothed and appeased the eye and the soul of that gentleman; for in my loftiest aspirations I never contemplated such a result. It appears, however, that Mr. Mushet has learned the truth of the adage, enough is as good as a feast, and therefore gives us timely notice that he wants no more of the refreshing elixir which has done him so much good.

In looking over the effusions of Mr. Mushet's soothed soul, I have been somewhat surprised at two things. First, the power of his memory, which I had believed to be rather feeble; and, secondly, the innocent simplicity of his deductions. Tubal Cain, with his blacksmith's shop, and a host of primitive artizans are presented to our view with all the freshness and vigour of life. Mr. Mushet has no doubt bestirred himself, and like a prudent man, used every exertion in order to avoid the abyss to which his folly had brought him. In his investigations of the Tubal Cain process of iron-making the feats of another personage seem to have met his view and fired his soul. Evidently he remembers that beautiful narrative of David and the Giant, which he read in his boyish days, and inferring that because he is a David, he will be similarly successful in the use of simple weapons, now aspires to exhibit his skill in the use of the sling and the stone, trusting, no

doubt, that like the youthful David, he, too, will eclipse his foe, even the "iron beadle," and become a king. Well, well, if such be his ambition, let him take his sceptre and his crown, but let him take heed that the sceptre be not made of sand, and that the crown be not made in iron after the fashion of those useful ornaments which adorn the tops of certain chimnies. But let us reason together. Does he think it prudent in these matter-of-fact, powder and shot days, to have recourse to such feeble weapons as a sling and a stone? for, certainly his arguments partake very much of that character. Does he not think it would be advisable to bring forth sharper weapons—more forcible and telling arguments, when presuming to contend with the giant *Truth*, armed as he is with justice, and supported by the battalions of common sense, and the artillery of consistency? I ask these questions in a friendly spirit in consideration of his past labours, and as I do not wish to see him overthrown without first raising the voice of mercy and extending a helping hand.

The first pebble hurled from David's sling bears the unmistakable impress of personality. This might have been inconvenient had it reached the mark; but, unfortunately for the little champion, it has wavered in its course, and in its fall has been shattered to atoms; and to complete the mishap, my little dog, Nettler, with one wag of his mischievous little tail has scattered the atoms to the winds, thus depriving me of the pleasure of analyzing its parts. As, however, Mr. Mushet has been pleased to attach to me a "clique," I will on their behalf, state that we are nowise in error as to his position in this matter. Mr. Mushet denies that he said he had "no faith" in Martien's invention, and states that he said he had "no faith" in the "Renton process as an object of enterprise in this country" Here, however, his memory fails him, or he is guilty of a gross untruth. Mr. Avery's assertion of Martien's claims was made August 23, and in that letter the precise nature of his client's invention was stated. On the 30th, Mr. Mushet replied to Mr. Avery's letter, and therein says, "I have for some months been very kindly invited to witness *Mr. Martien's* invention at the Ebbw Vale Iron Works, where everything was nicely arranged for me. Had not other engagements hindered my visit, I should of course have liked to see how it was managed at such important works, but I must candidly confess, I did not entirely repent being detained away. I had no wish to be placed in a position to be compelled to discourage or to sanction by my presence operations in which I had *no faith*, and could not render any service." Now no mention whatever is here made of the "Renton process," whereas, the precise nature of Martien's claims are specified. It is evident, therefore, that Mr. Mushet saw the weakness and insufficiency of Martien's invention, or else that he did not understand what he was writing about.

Pebble two, which is somewhat irregular in form, bears the name of Error, and was evidently intended to give Mr. Bessemer an awkward knock; but here again our friend David has signally failed. It has not reached the mark by a long way, and even if it had, it would have been equally harmless. Does not Mr. Mushet know that Mr. Bessemer is surrounded by a goodly army of iron masters who have supplied him with a coat of mail which renders him invincible to any such puny attacks, and who are willing to a man to stand by him come what may? Does he not know that licences for the whole term of the patents have already been taken by this goodly company for the annual production of 130,000 tons? Does he not know that a railway bar of the most difficult section possible has been rolled from one of Mr. Bessemer's ten inch square ingots not previously piled, or in any way previously wrought, and without the smallest portion of the flange being torn up? Does he not know that twice rolled iron has to be used for the flange of such bars, and that ten shillings per ton extra is always charged for them? Does he not think it an insult to common sense to suppose that such results could accrue from a phantom? And does he not know that his insinuations concerning the Ebbw Vale slag experiments are as futile as they are groundless?

But, lo! our friend again rotates, and with a tact peculiar to himself becomes transformed from a warrior to a schoolmaster, and from the latter to a physician. Casting aside the sling, he takes up the birch, and with sapient air expatiates on the word *remorse*. Surely Mr. Mushet must be sadly "used up," to be obliged to fly to such feeble subterfuges. Does he not think it would be better to turn carpenter, and make himself a pair of wooden legs, or at least a pair of crutches, for it is certain he has now no legs to stand upon?

But in the capacity of physician, the sling and the birch are both thrown aside, and Mr. Mushet very considerately recommends me to guard against the cold winds and November fogs which are approaching, in order to avoid ophthalmia. Really this is very kind, and I regret exceedingly that I cannot act upon his advice. However, if needs be, I will wear spectacles, for the weathercocks must be watched. The cold

winds of censure must be braved, and the mists of his effusions must be penetrated, in order that science may have free course, and that her fruits may ripen to perfection.

But as Mr. Mushet wishes me to suspend my reappearance until spring, perhaps he will allow me to inquire *where* it is likely I shall have the pleasure of meeting him then. When he is ready for the onset, if he will be so good as to inform me of the *whereabouts* of his headquarters, it will much oblige, as I would rather meet him face to face, trusting to the bare arm of truth and justice, than to be pelted at from behind a hedge. If he will favour me thus far, I shall be most happy, should circumstances warrant it, to assist at the coronation of David the Second, king of the weathercocks.

I am, Sir, yours, &c., WILLIAM GREEN.
Nov. 3, 1856.

CAOUTCHOUC (INDIA RUBBER) AND ITS ADULTERATIONS.

To the Editor of the Mechanics' Magazine.

SIR,—I ought to remark in this paper, that in all the formulas contained in its predecessors, as well as those which follow, *Para rubber is used*, which is now nearly four times the cost of Java, and is frequently more. This circumstance has for some time been attracting the attention of manufacturers, and bids fair to shut out almost the use of the former in all goods confined in moulds to vulcanize. I would call the especial attention of engineers to this fact, as Java materially reduces the cost, and needs very little judgment on their part to adopt it in these forms, in place of the expensive kind. I do not say that it is so strong a gum as Para, but I feel certain that the manufacturers will be awake, and use it, without perhaps yielding the advantage out of their own factories, and therefore it is necessary for consumers to try how far they can "assist themselves" without their benevolence, especially as "Java gum" is now so readily and cheaply cleansed of all dirt or gritty matter. These remarks apply to the recipe I now hand, which is termed—best pure spring, or washers, &c.

Grind together	£	s.	d.
30 lbs. Para gum, at 1s. 11d...	2	17	6
5 „ Oxide zinc, at 3½d.	0	1	6
2 „ Carbonate magnesia, at 4d.	0	0	8
3 „ Common chalk..... / 2 „ Porcelain, or Cornwall clay.....	0	0	1
30 ozs. Pure sulphur	0	1	0
Mill costs on 44 lbs., at 3d.....	0	11	0
	£3	11	9

This costs 1s. 8d. per lb., and is sold at 4s. 6d., and though heavier, is intended to meet Messrs. Mackintosh and Co.'s article at 5s. The difference in density renders the latter the cheapest to the consumer, while the reduced price of the former catches the unsuspecting trader in these goods, and frequently obtains his preference.

The companion quality to the above, for large valves, and packing in sheets, is made as follows and is styled—best pure packing.

Grind together	£	s.	d.
30 lbs. Para rubber, at 1s. 11d.	2	17	6
5 „ Oxide zinc, at 3½d.	0	1	6
5 „ Porcelain or Cornwall clay	0	0	1
28 ozs. Pure sulphur	0	1	0
Mill costs on 42 lbs., at 3d.....	0	10	6
Total.....	£3	10	7

This costs 1s. 7d. per lb., and is sold at 4s. 6d. per lb., and is a trifle heavier than the pure spring quality.

It will be perceived, that sometimes pure sulphur is used, and sometimes the common flowers of sulphur; the former is thought to render the goods more soft and velvety, but the difference in their relative cost is very wide, and the writer will not undertake to say how far the marketable value of the goods is improved, but thinks it will be admitted, that their intrinsic value to engineers is not altered in any way.

I may here observe, that carbonates work best in all moulded goods, but not otherwise, and it is necessary they should be retained therein until quite cold, or they swell out of shape; but in packing, &c., vulcanized openly, oxides should be selected, as there is little or no chemical action with sulphur or heat. I have made no mention in these papers of very finely pulverized talc, or French chalk, which, from its cheapness, if well bought, and its being unaffected by heat, and its slippery nature, is invaluable as a top dressing, well rubbed in, upon the surface of all white goods for open vulcanizing, as well as dusting the sheet zinc upon which they are laid. It is equally valuable in all goods cured in rolls, such as medical sheeting, &c., and entirely renders unnecessary the rays of the sun afterwards, needing only to be wiped off with a dry cloth after vulcanizing.

In my next I will give you the forms for Common White Goods, of which large quantities are made, and as I have occupied so much space in this paper, must defer my remarks upon the subject of vulcanization of caoutchouc, and conclude this, by thanking you for so kindly inserting in your valuable Magazine the documents of, Mr. Editor, yours, &c., W. H. HERBERT.

Mitcham Common, Sept. 25, 1856.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

MOTAY, C. M. T. DU, and J. J. FONTAINE. *Improvements in treating cast iron.* Dated Mar. 1, 1856. (No. 535.)

The patentees' object is to purify and decarbonize cast iron simultaneously, either in puddling or finery furnaces, so as to convert it into wrought iron having the properties of steel. The patentees use artificial fluxes or chemical agents reacting, either together or separately, on the cast iron during its reduction to the state of wrought iron, without in any other way changing the ordinary puddling and refinery processes. Their artificial fluxes may be prepared in either of several modes, of which the following is first:—They melt the scoria commonly employed in puddling and finery furnaces with silicate of alumina, obtained either from clays, feldspars, refractory earths, or from marls, or any other silicates of alumina, combined with silicate of the alkalies, alkaline earths, or metallic oxides. They add to this flux, before or during its fusion, first, a bicarbonate of potass or soda; second, a silicate of the protoxide of iron, or any other anhydrous silicate.

RUALEM, F. *An improvement in the manufacture of fuel.* Dated Mar. 1, 1856. (No. 537.)

This invention has for its object so to conduct the process of manufacture that the substances used may be moulded into the desired forms by simply placing the mixed materials in the state of powder in the moulds, and then, by carbonizing the fuel, to obtain the coal in a moulded state. It is preferred to employ angular iron moulds in rectangular frames, so as to produce triangular blocks. By means of plates between the frames of the moulds, several frames may be placed one on the other in the oven or retort. The materials used are small coal, charcoal, coke, and sawdust, though others may also be used; rosin or dry bituminous matter may be added.

MAYNARD, R. *Improvements in machinery for cutting and separating agricultural produce.* Dated Mar. 3, 1856. (No. 538.)

This invention was described at page 348 of No. 1731.

OPPENHEIMER, A. *Certain improvements in machinery or apparatus for stretching or distending velvets and other piled goods or fabrics, for the purpose of cutting the pile of such goods.* Dated Mar. 3, 1856. (No. 539.)

This invention consists in the employment of certain rollers, one of which is adjustable, for stretching the fabric longitudinally, and of certain endless side rails, &c., for stretching it transversely.

WALLACE, J., jun. *Improvements in bleaching, washing, cleansing, and drying textile fabrics and materials.* Dated Mar. 3, 1856. (No. 540.)

This invention relates to centrifugal drying and separating apparatus. This apparatus, which ordinarily consists of a cage or chamber of some permeable material mounted upon a vertical spindle, is applied so as to be available for bleaching, cleansing, and drying various classes of goods. Steam or heated water is passed into the chamber through a tubular shaft, so as to mingle with the goods, and with the chemical and other ingredients employed in the process.

HOMAN, J. *An improved mode of driving sewing-machines.* Dated Mar. 3, 1856. (No. 541.)

This invention relates to a mode of varying the speed, or producing a dwell, in the action of sewing-machines. The patentee connects the machine with the motive power of the engine or driving gear, by means of a loose strap which will not act sufficiently until tightened by tension pullies. These pullies he puts under the command of the attendant, by connecting the same with a treadle.

ASPINALL, J. *Improvements in machinery for curing sugar, or extracting moisture therefrom, applicable to separating liquids from solids.* Dated Mar. 3, 1856. (No. 542.)

This invention consists in certain arrangements of self-feeding and self-delivering centrifugal machinery.

HODGES, J. E. *Improvements in machinery for the manufacture of looped and textile fabrics.* Dated Mar. 3, 1856. (No. 543.)

This invention consists—1. In making looped fabrics in knitting frames without the aid of jacks, sinkers, or loop wheels, the loops being formed by the needles only, and from a thread or threads carried across the width of the work; and in certain arrangements of machinery whereby the thread can be varied, both as to colour and materials, as desired. 2. In certain sliding bars or cams, or slur bars and slur cocks, for projecting and withdrawing the needles in the machinery employed. 3. In certain arrangements of top machines and ticklers.

VENABLES, J. *Improvements in ornamenting articles made of clay and other similar plastic materials.* Dated Mar. 3, 1856. (No. 544.)

This invention consists in modes of constructing the moulds or parts of the moulds used in making such articles, so that raised or depressed ornaments or patterns, resembling impressions of the leaves of vegetables, feathers, the wings of insects, and other natural objects, may be produced upon

the articles whilst they continue in a plastic state. In constructing the mould, the patentee fixes the natural objects either upon the face of a block upon which he intends to make the mould, or upon a form to be afterwards used in producing the block for the formation of a mould. He then takes a cast in plaster of Paris, or other material, from the face of the block to which the leaves have been applied.

HODGES, J. E. *Improvements in machinery for the manufacture of looped fabrics.* Dated Mar. 3, 1856. (No. 545.)

This invention consists in working machines for making looped fabrics, by making the needles traverse at pleasure from side to side of the bars which support them.

BROOMAN, R. A. *An improved fabric suitable for ladies' garments.* (A communication.) Dated Mar. 4, 1856. (No. 548.)

This invention consists of an improved fabric which the inventor designates "Tissu Imperial," and which is manufactured of wool, cotton, or linen. Cords or braids are laid in the warp (to impart a certain resistance vertically) either regularly or in interrupted series. Horizontal stiffness is imparted by horse-hair, braid, gutta percha, caoutchouc, elastic ribbons, whalebones, caur, bristles, or other like stiffening agent.

LAMBERT, T. *Improvements in apparatus for regulating the drawing off of water and other fluids.* Dated Mar. 4, 1856. (No. 549.)

The barrel of the improved cock has a valve capable of being pressed on to two seats at a distance from each other, so as to prevent more than a determined quantity of fluid passing, notwithstanding the handle continues to be acted on. The fluid is stopped for the most part from flowing when the valve in the barrel is brought to press on the second seat, the valve being at other times (when free) pressed up to its first seat by the pressure of the fluid acting on a piston or diaphragm (on the stem of the valve) of larger diameter than the valve. The fluid is admitted to the barrel at a position intermediate of the valve and piston, so that it is at all times pressing on both the piston and the valve.

ROSENBERG, C. T. *Improvements in ornamenting china, glass, and other surfaces, when transferring printed impressions.* Dated Mar. 4, 1856. (No. 550.)

This invention consists in applying by transfer prints, each obtained from a series of engraved plates, on to china, glass, and other surfaces, preferring aquatinta plates for this purpose, though plates engraved according to other systems may be similarly used, in combination with or separate from aquatinta plates; or plates may be used wherein the engraving may be of a mixed character.

SAMUELSON, M. *Improvements in screw propellers.* Dated Mar. 4, 1856. (No. 551.)

This invention was described and illustrated at page 369, of No. 1732.

CLEGG, S., and J. KAY. *Improvements in machinery or apparatus for warping yarns.* Dated Mar. 5, 1856. (No. 554.)

This invention relates to that part of the warping apparatus between the neck and the mill, or that part which guides the warp threads to the mill, and consists in arranging it so that these threads shall be perfectly separated in the form of a shed.

KAY, R. D. *Improvements in the manufacture of fabrics from fibrous materials.* Dated Mar. 5, 1856. (No. 555.)

The patentee takes Clark's felt, and by means of dissolved caoutchouc or other suitable cement, attaches any woven fabric either to one or both sides or surfaces of the felt.

BILLINTON, W. *An improved method of treating wooden railway sleepers.* Dated Mar. 5, 1856. (No. 556.)

This invention consists in exerting mechanical pressure endwise of the grain or fibres of the sleeper, when the wood is either green or dry, to compress, strengthen, and consolidate the fibres or grain so as to render the sleeper impermeable, and not subject to decay.

LAST, S. *Improvements in trunks or portmanteaus, and an improved lock for the same.* Dated Mar. 5, 1856. (No. 557.)

This invention consists — 1. In a new arrangement of the flaps or compartments of trunks or portmanteaus, whereby three compartments, when opened out for packing, may be flat on the same level; also in fitting the covering in such manner as to make the sides, when closed, flush. 2. Of an improved lock formed of a circular bolt with part cut away, turned by a stud outside the lock plate, and of a hasp with a peculiarly shaped bolt also turned by a stud.

MORGAN, C., and C. R. VICKERMAN. *An improved preparation of fuel, and the application of the same to steam boiler purposes.* Dated Mar. 5, 1856. (No. 558.)

This invention consists—1. In preparing anthracite coal for consumption in closed furnaces by driving off by the application of heat the gases and watery particles contained in the coal. 2. In the use of the prepared fuel in the furnaces of marine and land tubular boilers.

POCHIN, H. D. *Improvements in the manufacture of aluminous and siliceous compounds.* Dated Mar. 6, 1856. (No. 562.)

This invention consists in treating a mineral containing variable proportions of silica and alumina, such as China clay, with powdered charcoal, peat, pitch, pitch-coke, soot, sawdust, or other carbonaceous matter,

leaving but little ash and no iron after combustion in a furnace, for the manufacture of aluminous and silicious compounds in such manner as that the alumina may be brought into a condition to be more easily acted on by acids, and the silica of which can be obtained in an almost pure state, suitable for the ordinary purposes for which it is employed.

MORRISON, R. *Improvements in pile-driving machinery.* Dated Mar. 6, 1856. (No. 565.)

This invention is described at page 443 of this Number.

NEUBURGER, A. *Extraction of oil from a vegetable substance not hitherto so used.* Dated Mar. 6, 1856. (No. 567.)

This invention consists in obtaining oil from the plants of the genus thlaspi, and allied genera of the order crucifera, which oil forms a substitute for colza oil, being obtained and purified in the same manner.

SCOTT, J. W. *An apparatus for fastening or securing buttons, which may itself be used as a stud or button.* Dated Mar. 6, 1856. (No. 568.)

This apparatus consists of a metal loop or staple formed with a head at each end, and made flat under the heads, and of a disc or plate formed with two slots at the sides leading into sunken parts for receiving the heads of the staple, which, when forced into the recesses, lie flushed, or nearly so, with the upper surface of the disc or plate.

DOWNIE, J. *Improvements in moulding or shaping metals and other materials.* Dated Mar. 7, 1856. (No. 570.)

This invention relates to a system of moulding wherein the pattern has motion given to it during moulding, so as to effect the finishing of the moulded surface by mechanical means, and leave nothing to be done by hand on the withdrawal of the pattern from the moulds.

HAHNER, G. *Certain improvements in the treatment of ores.* (A communication.) Dated Mar. 7, 1856. (No. 571.)

These improvements relate to a mode of decomposing certain metallic oxides, and especially the oxide of copper, at a high temperature in the presence of vapours of water and of silica, by means of chlorides, forming oxychlorides or chlorides soluble in water, avoiding the loss of metal from the formation of free soda, or soda combined with silica, &c., by the addition of an acid, and in separating the metals and other substances contained in the solutions.

BROWN, D., and W. *An improvement or improvements in rolling railway switches, from railway bars, and in rolling taper ends or other bars requiring the same.* Dated Mar. 7, 1856. (No. 572.)

This invention was described and illustrated at page 368 of No. 1732, for October 18.

HOLMES, F. H. *Improvements in machines known under the name of magneto-electric machines.* Dated Mar. 7, 1856. (No. 573.)

This invention consists—1. In the symmetrical arrangement of certain parts of the machines, viz., the helices and magnets; and, 2. In an improved commutator and conductor, and means of adjusting the conductors on the same.

COOK, T. *Improvements in portable bedsteads.* Dated Mar. 8, 1856. (No. 574.)

This invention consists in making the pillars of bedsteads tubular in two or more parts, sliding the one into the other in the manner of a telescope; or the separate parts may be screwed into each other by means of screws on their ends.

YOUNG, H. B. *Certain improvements in steam engines.* Dated Mar. 8, 1856. (No. 575.)

This invention comprises the application to a fixed cylinder, not having a trunk working therein, of an oscillating or vibrating piston rod, one end of which is connected to the piston, and the other directly to the crank pin, without the intervention of a connecting rod, slings, or other similar contrivances, and so as to enable the free vibration of the piston rod through the cylinder cover without the escape of steam therefrom.

COOKE, H. *Improved machinery or apparatus for dyeing and dressing yarns or threads.* Dated Mar. 8, 1856. (No. 576.)

This invention consists in the application or adaptation to dressing machines commonly employed for dressing and sizeing yarns, of dyeing or colouring troughs, rollers, and drying apparatus, for the purpose of dyeing the yarns in the dressing machine, and simultaneously with the process of dressing.

STEWART, D. Y. *Improvements in moulding or shaping metals.* Dated Mar. 8, 1856. (No. 578.)

This invention relates chiefly to the moulding of metal pipes or the manufacture of hollow cast-iron articles of cylindrical contour; but it is also applicable to the moulding or casting of other articles of a general form more or less similar to that of pipes. The apparatus employed in carrying out this invention in practice consists of a core bar, on which the core surface is formed for producing the internal figure of the pipe or hollow article to be moulded and cast, capable of being expanded or collapsed in diametrical dimensions.

HANNAH, R. *Improvements in pottery kilns.* Dated Mar. 10, 1856. (No. 579.)

This invention consists, according to one modification, in forming a secondary open-

ing for feeding the fire and admitting air in the vertical side or face of the furnace, above the doorway or glut. Or this secondary opening may be made in an inclined or curved portion of the brow of the furnace, so that the fuel can be introduced laterally, provided it is not directly above or over the fire, the opening usually made in the latter position being of course closed if the improvement is applied to old kilns, or the top of the furnace being made solid and without an opening if the kiln is being newly erected.

NOLET, P. D. *Improvements in pen-holders.* Dated Mar. 10, 1856. (No. 581.)

The patentee takes a piece of India rubber tube, and affixes it securely on the lower end of a stick. He also prepares a certain small metallic guard, the use of which is, that upon being inserted between the rod and the inside of the tube, the metal pin or nib is securely held between it and the stick.

MILLS, J. *An improvement in spindles used in certain machines for preparing, spinning, and doubling cotton and other fibrous substances.* Dated Mar. 10, 1856. (No. 584.)

This invention consists in applying bushes or hollow metal tubes to the spindles used in the above-mentioned machines, and in such manner that the bush will rotate with the spindle, and at the same time be at liberty to slide up or down on the same as may be required.

DAVY, J., and J. MILNES. *Improvements in looms for weaving plaids, plain weaving and flounces, or other ground-work.* Dated March 10, 1856. (No. 586.)

These improvements consist in adapting to looms, and combining therewith, certain improved mechanism for working the shuttle boxes, so as to bring one or other of them into proper position for being operated upon according to the desired variation in the colour of the weft, the said mechanism being operated upon by the cylinder and noggin-wheel while in motion. And an important feature consists in stopping the aforesaid cylinder for working when necessary, without stopping the other working parts of the loom, by which the patentees are enabled to weave plain flounces, or any ground-work; and to effect this they employ catch levers, so connected that, as the aforesaid cylinder revolves, it imparts motion to a system of endless cards, in which are placed legs or pins at certain distances asunder, according to the pattern, and acting upon certain catch levers, &c.

TOLHAUSEN, A. *Certain improvements applicable to bakers' ovens.* (A communication.) *Dated* March 11, 1856. (No. 587.)

This invention consists in furnishing an *oven with an* endless chain of shelves, which has a continuous ascending and descending motion imparted to it by the weight of the substance undergoing the baking, or by any other means, and which is thereby, with the application of suitable gearing, caused to give motion to the machinery by which doors, suitably arranged, are opened and closed in proper succession, and at proper intervals of time, to admit into the oven the substance to be baked, and to draw the same from the oven after it when they have been baked for a sufficient length of time. The bread is placed on a series of carriages which enter at suitable intervals into a door at the upper part of the oven by one branch of a railway.

MAGGS, O. *Improvements in the straw shaking apparatus of thrashing machines.* Dated March 11, 1856. (No. 590.)

In this invention a series of axes at a distance from each other each, having several projecting radial arms on either side, are geared together, and caused simultaneously to rotate in such manner that the arms of one axis may pass freely between those of the next axis on either side, and the gearing is such that when the arms of one axis are in a horizontal plane the next are in a vertical plane, by which the straw, &c., are in succession passed from the arms of one axis on to the arms of the next, and thereby are well shaken, and so on according to the number of axes used. The arms of the lower axis move through a fixed grating to prevent any straw or matters getting through without being shaken.

PETITPIERRE, H. *Improvements in sawing or cutting stone.* Dated Mar. 11, 1856. (No. 591.)

The object is to facilitate the hand labour. A frame is used which is mounted on wheels, so that it may be easily transported. On the frame is an axis and a crank handle. From this axis a to-and-fro motion is communicated to an upright bar, centred at one end to the framing. To this bar a connecting rod is attached, which communicates motion to the saw, which is of an ordinary description, and is guided in its to-and-fro motion by suitable upright guides; a vessel is placed on the top of the stone to supply sand and water to the saw.

FOWLER, J., jun. *An improvement in the manufacture of bricks and tiles.* Dated Mar. 11, 1856. (No. 592.)

This invention is applicable to machinery where screws are used to express clay or brick earth through moulding orifices or dies. The improvement consists in applying discs or screw wheels through the cases of the screws, in such manner that such wheels may be rotated by the screws, by which means the portions of the discs or screw wheels within the cases will act as longitudinal partitions in the cases of the screws,

and prevent the rotation of the clay or brick earth with the axes of the screws.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

CODDÉ, L. *A system of submarine communication.* Dated Mar. 4, 1856. (No. 547.)

This invention consists in a mode of constructing submarine railways. The inventor employs iron tubes 18 feet in diameter, provided internally with joints. To prevent water from entering the tubes when being sunk, and previous to their junction, he closes the extremities with an iron plate, screwed or bolted to the joints. When all the tubes are united together, communication is opened through the whole length by removing certain plates; the rails are then laid down.

PLATT, J. *Improvements in machinery for spinning, doubling, and winding cotton and other fibrous materials.* (A communication.) Dated Mar. 4, 1856. (No. 552.)

This invention refers to machines upon the throttle principle, that is, to those in which the winding on is accompanied by friction, usually termed the drag; it is now proposed to dispense wholly or in part with that method, and to supply suitable apparatus which will offer a resistance to the air during the necessary rotary motion of the bobbin. A practical method of accomplishing this consists in the adaptation of a fan connected to the bobbin so as to revolve with it, and in so constructing the effective surfaces of the vanes that they may be enlarged or contracted at pleasure.

LODGE, G., sen., J. OGDEN, and G. LODGE, jun. *Improved apparatus for effecting the consumption of smoke in steam boiler and other furnaces.* Dated Mar. 4, 1856. (No. 553.)

This invention consists in the employment of a hollow pillar which carries at a level a little above the furnace bridge an air chamber, formed somewhat like a flattened tube, and provided with a series of tubes in its opposite sides, for distributing (in streams) the air which passes up the hollow pillar from the ash-pit, or from an air-supply tube.

GREEN, W. *Improvements in ornamenting and waterproofing fabrics.* Dated Mar. 5, 1856. (No. 559.)

The fabrics are first coated with a surface of flexible material, such as printers' ink or varnish of the colour desired, by a roller coated by preference with the composition used in making printing-rollers, and this composition roller transmits the coating of varnish to an iron roller which distributes it equally on the surface of the fabric. The fabric thus coated receives a coating of dissolved starch or of farinaceous or mucilaginous matter. The fabric when dry is subjected to a process of calendering or embossing, to produce the pattern of surface desired.

SHARP, T. B., and T. FORSYTH. *Improvements in coupling railway rolling stock.* Dated Mar. 6, 1856. (No. 560.)

This invention consists in coupling railway rolling stock by means of self-adjusting draw hooks, the object being to economize the power hitherto lost when the line of traction is not laterally and horizontally true.

JACKSON, L. D., and H. MYERS. *The combining air and water as a power.* Dated Mar. 6, 1856. (No. 561.)

This invention requires engravings to illustrate it.

PHILP, R. *Improvements in paddle-wheels for propelling vessels in water.* Dated Mar. 6, 1856. (No. 563.)

These improvements refer to the form of the floats, which are so constructed as to show a float whose greatest linear horizontal dimensions (measured at right angles to the side of the ship) shall terminate in two points, &c.

TISDALL, T. *Improvements in machinery or apparatus for propelling steam vessels.* Dated Mar. 6, 1856. (No. 564.)

This invention consists of a double propeller working in slides under the water. The slides to be placed one above the other, and the floats so arranged that when the one is in the act of propelling the other is drawn forward.

BROWNE, B. *Improvements in the construction of spindles for locks and latches, and in the mode of connecting the same thereto, and to their respective knobs.* Dated Mar. 6, 1856. (No. 566.)

This invention relates particularly to such spindles as are constructed with contrivances for varying the distance between the knobs according to the thickness of the door. The peculiar feature of it consists in constructing the spindle of two separate parts, and connecting them by screwing one into the other, and placing a tube over the joint.

BROOMAN, R. A. *An improved method of creating a vacuum, together with certain arrangements of apparatus for preserving substances liable to injury or corruption from prolonged exposure to the atmosphere.* (A communication.) Dated Mar. 6, 1856. (No. 569.)

The patentee describes an arrangement of pipes and vessels in which a vacuum is formed by the displacement of the water within them.

ROBERT, J. J. A process which extracts

the greasy particles contained in the waters after the cleansing of wools, by the means of sulphate of zinc and arsenious acid. Dated Mar. 8, 1856. (No. 577.)

The inventor makes use of large washing tubs made of wood, with bottoms grooved by a serpentine tubing of iron or brass (perforated) and the waters after the cleansing of wool poured into these tubs are heated by a generator of steam affixed to the tubing. When the temperature is at 60° Reaumur, he throws in sulphate of zinc and arsenious acid; the reaction commences immediately, the greasy parts which are in solution are precipitated, and rise to the surface of the liquid. He adds the mixture till no more precipitate is produced. To clear this precipitate after having collected it by a cullender, he places it into a large cast-iron boiler, with clear water and sawdust, boils the whole together six hours, and passes it into a hot press, which causes the greasy particles to ooze out.

CHABLIN, L., and A. HENNIQUE. *A new mode of ornamenting ceramic and vitreous products.* Dated Mar. 10, 1856. (No. 580.)

The design is made upon the article to be ornamented, by a brush dipped in a paste composed of chloride of silver mixed with spirits of turpentine, and the article is placed in a muffle furnace, and heated to a red heat. When cold, it is surrounded with copper wire, and placed in an electro-plating solution of silver or gold, and the metal is deposited by the usual galvanic battery. The design is finished by a burnisher or brush in the usual manner.

BERARD, P. H. G. *Improvements in manufacturing artificial flowers and foliage.* Dated Mar. 10, 1856. (No. 582.)

This invention relates—1. To the production of artificial flowers and foliage, by modelling from the natural plants by the aid of plastic substances, collodion (combined with oil), gelatine (combined with syrups, gum, or glycerine), and other analogous matters coloured as desired. 2. In giving a surface to artificial flowers thus produced by the aid of powdered silk.

BARTLEET, R. S. *Improvements in cases or holders for machine and other sewing needles.* Dated Mar. 10, 1856. (No. 583.)

This invention consists in substituting for paper wrappers, cases or holders, formed either of glass, china, wood, horn, cardboard, metal, &c., and with the bottom inclined, or otherwise formed so as to cause the needles to range one above the other, so that any one may be taken without disturbing the next below.

EMERY, F. J. *An improved means of arresting the descent of cages or corves in the shafts of mines, which may also be applied to stopping the fall of weights.* Dated Mar. 10, 1856. (No. 585.)

This invention consists in the employment of side toothed racks; in mounting upon the cages or corves toothed wheels, which turn loosely in the racks when the cages are being lowered in the proper manner; in fixing upon the axes of the toothed wheels, ratchets, or toothed pinions, and over them pauls which, upon the breaking of the rope or chain by which the cage is being lowered, become engaged in the ratchets, consequently hold the toothed wheels stationary in the side racks, and stop the further descent of the cage.

COLLINS, J. *A machine for pulverizing, crushing, pressing, and cleaning land.* Dated Mar. 11, 1856. (No. 588.)

This invention consists—1. In the application of cylinders of a ribbed or corrugated form and surface, placed on a horizontal shaft. 2. In the application of certain rings or discs, to be coupled or bolted together by a number of bars or rods, so as to form one continuous cylinder or barrel, such rings or discs to have ribs, lines, or other projections of metal. 3. In the application of certain rails, bars, or other projections for cleaning the said rings, discs, cylinders, or barrels. 4. In the application of metal lines or rakes for the purposes of mowing and cleaning the land, such lines or rakes to be placed in the front of any rings, discs, cylinders, or barrels, as herein provided, or to follow the same.

PROVISIONAL PROTECTIONS.

Dated September 3, 1856.

2041. Jean Baptiste Marcelin Jobard, of Bruxelles. Improvements in the manufacture of lamps.

Dated September 17, 1856.

2178. Alfred Lodwick Newman, of New Church-street, Bermondsey. Improvements in processes for separating animal from vegetable fibre, and for adapting the products to manufacturing purposes, and in the machinery employed therein.

Dated September 19, 1856.

2199. Amos Hustler, overlooker, of Bradford, York. Improvements in looms for weaving.

Dated September 27, 1856.

2265. David Law, of Glasgow, N.B., and John Inglis, of the same place, ironfounders. Improvements in moulding or shaping metals.

Dated October 3, 1856.

2316. John Hall, jun., of Mount Pleasant, Walmersley, Lancaster, spinner and manufacturer. Improvements in looms.

Dated October 6, 1856.

2333. John Gedge, of Wellington-street South, Strand, Middlesex. Improvements in the preparation of rocky substances for obtaining mineral manure. A communication from J. Urfus.

2335. Andrew Dunlop, of Glasgow, N.B., grain merchant. Improvements in dressing or sifting flour or meal.

2337. Victor Avril, of Paris, engineer. Improvements in the manufacture of iron and steel and in the construction of furnaces to be employed therein, also in the obtaining of a certain agent employed in such manufacture.

Dated October 7, 1856.

2339. Thomas Briggs Smith, of Taunton, U.S., now of Gracechurch-street, London. Improvements in the permanent way of railways and in the running of railway carriages.

2341. William Nehemiah Parsson, of Southwark Bridge-road, Surrey, engineer. An improved construction of rotary sawing machine.

2343. James Hinks, of Birmingham, manufacturer. A new or improved manufacture of metal boxes.

2345. William Wilkinson, of Nottingham, engineer. Improvements in ornamenting glass, and in the preparation of the materials employed therein.

2347. Jules Adolphe Le Franc, of Cecil-street, Strand, Middlesex. An improvement in lubricating oil cans or vessels. A communication.

2349. William Marriott and David Sugden, of Huddersfield, York, agricultural and manufacturing chemists. An improvement in purifying coal gas.

Dated October 8, 1856.

2351. James Chlosso, of Camden-town, Middlesex. An apparatus for damping and affixing adhesive stamps and labels.

2353. Edmund Alfred Pontifex, of Shoe-lane, London, manufacturer, and George Henry Ogston, of Greenwich, Kent, chemist. Improvements in the manufacture of tartaric and citric acids.

2355. John Leigh, of Manchester, surgeon. The use or application of a certain substance or substances in the manufacture of paper for stiffening and sizing the same.

2357. Thomas Dugdale, jun., of Blackburn, Lancaster, cotton spinner. An improved lubricator.

2359. Peter Ward, of Liverpool, chemist. An improved composition for coating the bottoms of ships.

2361. Charles Iles, of Birmingham, manufacturer. Improvements in frames and stands, and in suspendors or pegs for holding or suspending hats, coats, and other articles.

Dated October 9, 1856.

2365. James Atkinson Longridge, of Fludyer-street, civil engineer, and Thomas Richardson, of Newcastle-upon-Tyne, chemist. An improvement in constructing the fire boxes of locomotive steam boilers.

2367. Charles Burton, of Regent-street. Improvements in machinery for washing and cleansing fabrics and clothes.

2369. Joseph Bennett Howell, of Sheffield. Improvements in the manufacture of cast steel.

2371. Lewis Jacob Jordan, of Berner-street, gentleman. A medicine for the cure of venereal affections.

Dated October 10, 1856.

2373. Jean Alexandre Labat, jun., of Bordeaux, France, and of Essex-street, Strand. Improvements in closing or stoppering bottles, jars, and other like vessels.

2375. Christopher Richard Norris Palmer, of Southampton, esquire. A signalizing apparatus for carriages, and improved telegraph or signal apparatus, applicable to other purposes.

2377. William Johnson, of Lincoln's-inn-fields, civil engineer. Improvements in the manufacture of fulminating powder. A communication from J. Delavo.

2379. John McInnes, of Liverpool, oil merchant. An improved surface mineral coating for protecting iron and other substances, and an improved vehicle or varnish by which it is applied, and which varnish may be used with or without the addition of other substances.

2381. Robert McConnell, of Glasgow, bleacher, and Alexander Mackenzie, of the same place, mechanist. Improvements in supplying steam boilers with water, part of which improvements or modifications thereof are applicable for the transmission of fluids and the indication of fluid levels under pressure.

Dated October 11, 1856.

2383. William Hindle Ashburn, of Blackburn, cotton spinner and manufacturer, and James Fairhurst, of the same place, cardmaster. Improvements in machinery or apparatus used in the preparation of cotton or other fibrous substances for spinning.

2387. James Latham, of Liverpool, broker. Registering the number of passengers by omnibuses and other vehicles and conveyances.

2389. George William Varnell, Royal Veterinary College, Camden-town. Improvements in mounting troughs, mangers, and apparatus used for feeding horses and other animals.

2391. Léopold Ador, chemist, and Edouard Abbadie, manufacturer, both of Paris, France. Improvements in the manufacture of colours from metals, and in the furnaces or apparatus for the same.

Dated October 13, 1856.

2393. Charles Sidney Johns, of Barnard's-inn, Holborn. Improvements in machinery or apparatus for preparing pulp suitable for the manufacture of paper.

2395. Benjamin Kisch, of Kennington, gentleman. An apparatus for containing an arrangement of cards or papers for selection. A communication.

2397. Giovanni Battista Platti, of Genoa. Improvements in the production of ice.

2399. John Stephen, of Glasgow, mill manager. Improvements in steam boilers and furnaces.

Dated October 14, 1856.

2403. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. An improved method of, and composition for, splitting or rending rock, stone and earth. A communication from Murtineddu and Co.

2405. Thomas Allen, of Clifton, Bristol. An improvement in the manufacture of iron and other metallic bedsteads.

Dated October 15, 1856.

2409. James Burrows, of Wigan, Lancaster, engineer. An improved arrangement of apparatus employed in winding coals or other minerals from mines, which said improvement is also applicable for other similar purposes.

2411. Archibald Turner and Luke Turner, of Leicester, elastic web manufacturers. An improved manufacture of elastic fabrics.

2413. George Hazeldine, of Lant-street, Southwark, coachmaker. Improvements in carriages requiring "poles" between the horses or draught animals.

Dated October 16, 1856.

2414. George Collier, of Halifax, York, engineer. Improvements in the manufacture of piled fabrics.

2415. Alfred Tooth, of Mincing-lane, London, merchant. An improved process for bleaching malt, whereby the colour is rendered more suitable for the brewing of pale or bright malt liquors.

2416. Carl Johan Laurentz Leffler, of Old Broad-street, London, gentleman. Improved apparatus for the casting of metals.

2417. Richard Ford Sturges, of Birmingham, manufacturer. A new or improved manufacture of rollers or cylinders for printing fabrics.

Dated October 17, 1856.

2418. Charles Napoleon Wilcox, of Islington, Middlesex, manufacturing chemist. Improvements in the preparation and application of certain vegetable matters, to be used in toilette soaps, pomades, and other like perfumery.

2419. Edward Tombs, of Islington, Middlesex. An improvement in screw propelling.

2420. Joseph Commandeur, of Lyons, France, gentleman. A mechanical apparatus for regenerating the impulsive force of any motive power.

2421. Ferdinando Foggi, of Southampton-place, New-road, professor of mathematics. Improvements in the manufacture of engines driven by steam or other vapour.

2422. John Green, of Charlotte-street, Marylebone. An improved cooking apparatus.

2423. Ebenezer Rogers, of Abercarn, Monmouth. Improvements in apparatus for the decomposition and combustion of fuel.

2424. Jane Elizabeth Reed, of Southgate, Middlesex. A mixture or compound for the cure of asthma, consumption, and other affections of the chest or lungs.

2425. Peter Armand Lecomte de Fontainemoreau, of Paris. Certain improvements in the construction of turbines. A communication.

2426. Peter Armand Lecomte de Fontainemoreau, of Paris. An improved process for purifying brandies and other alcoholic products. A communication.

2427. William Dray, of Swan-lane, London, agricultural implement maker. An improved method of, and apparatuses to be employed in, the stacking or storing of corn and other agricultural and horticultural produce.

2429. William Jeffrey, of Glasgow, packing-box maker. Improvements in machinery or apparatus for sawing or cutting wood.

2430. John McDowall, of Johnstone, Renfrew, engineer. Improvements in sawing or cutting wood.

2431. Napoleon Brécheux, of Paris, merchant. Improvements in looking glasses, applicable especially for dressing rooms and for other purposes.

2432. George Morton, of Keighley, York, watchmaker. Improvements in escapements for chronometers and other time-keepers.

2433. Thomas Frederick Henley, of Bromley, Middlesex. The employment of certain substances not hitherto made use of for the production of alcoholic spirits, and for the manufacturing of the same, the refuse material being applicable as a food for cattle.

2434. Alfred Vincent Newton, of Chancery-lane, mechanical draughtsman. Improvements in the manufacture of tufted pile fabrics. A communication.

2435. William Gossage, of Widnes, Lancaster, chemist. Improvements in the manufacture of coal-gas used for illuminating purposes.

2436. John Smith, of Kirtley, Suffolk, engineer. Improvements in heating the feed-water of steam boilers for marine and land purposes.

2437. Samuel Cunliffe Lister and William Tongue, of Bradford, York. Improvements in spinning.

2438. James Robert France, of Clarence-street, Islington, Middlesex, telegraphist. Improvements in electric telegraph apparatus.

2439. Frederick Arthur Magnay, of Taverhammills, Norwich, and Ralph Radcliffe Whitehead, of Royal George Mills, Saddleworth. Improvements in damping paper for printing.

2440. William Palmer, jun., of Sutton-street, Clerkenwell, manufacturer. Improvements in *roof candle*-lamps for railway and other carriages.

2441. Thomas Lawes, of City-road, Middlesex, feather merchant. An improved construction of agricultural implement to be used in tilling the land.

Dated October 18, 1856.

2442. Robert Hanham Collyer, M.D., of Park-road, Regent's-park. Improved method of manufacturing paper.

2443. Léon Joseph Pomme de Mirimonde, gentleman, of Paris. Certain improvements in reducing the friction of axles and axletrees of carriages on railways.

2444. Isidore Delcambre, of Paris, engineer. Improvements in machines for composing and distributing type.

2445. Joseph George, of Paris, mechanical engineer. An improved crane.

2446. Jacques Félix Deshayes, of Paris, dyer. Improvements in machinery for dyeing silk, cotton, or wool in hanks or skeins or woven fabrics.

2447. Henry Brown, of Halifax, York, worsted spinner. An improvement in spinning worsted.

2448. Thomas Flockton, of Trafalgar-square, Middlesex. Improvements in the consumption of smoke.

2449. Charles Humfrey, of Camberwell, Surrey. Improvements in the manufacture of grease for lubricating railway axles and other machinery.

Dated October 20, 1856.

2450. Joseph Harrison, of Blackburn, Lancaster, machinist. Improvements in machinery for warping yarns, part of which improvements are applicable to creels used for other purposes.

2451. Sir Francis Charles Knowles, of Lovell-hill, Berks, baronet. Improvements in the manufacture of iron and steel, and in the preparation of fuel used therein.

2452. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in farthingales or petticoats. A communication.

2453. Léon Philéas Huteau, of Paris. An improved petticoat.

2454. James Young, of South Shields, ship owner. An improved ventilator.

2456. Joseph Lacassagne, chemist, and Rodolphe Thiers, manufacturer, both of Lyons, France. An improved electric lamp.

2457. John Thomas Forster, of Wandsworth-road, mariner. Improvements in the symbols used in signalling.

2458. Josiah George Jennings, of Holland-street, Blackfriars, engineer. Improvements in the construction of wall caps, sleeper blocks for the basements of buildings, and bricks to be used as substitutes for wood bricks in building.

2460. Anthony Lorimier, of Bedford-square East, Commercial-road. An improvement in reworking vulcanized India rubber.

2461. William Parsons, of Pratt-street, Lambeth, manufacturing engineer. Improvements in generating and employing steam in steam engines.

2462. Henry Deacon, of Chelsea. Improvements in suspending carriage bodies.

2463. William Clay, of Liverpool, iron manufacturer, and Josiah Harris, of Dolgelly, Merionethshire, chemist. Improvements in the manufacture of iron and steel.

Dated October 21, 1856.

2465. Henry Thompson, of Great Harwood, Blackburn, Lancaster, warper, and Thomas Curtis, of Blackburn, warper. Improvements in the manufacture of healds or heddles.

2467. George Blair, of Leicester, machinist. Improvements in the manufacture of looped fabrics.

2469. Spencer Smith, of Soho, engineer. Certain improvements in furnaces.

2471. John Shaw, manager of Britannia Iron Works, Neithrop, Banbury, Oxford. Improvements in preparing the food of cattle.

2473. Edward Orange Wildman Whitehouse, of

London, gentleman, and Joseph Christopher Laws, of Brighton, mechanic. Improvements in tools for soldering metals.

2475. Hugh Lee Pattinson, of Scots House, West Boldon, Durham, chemical manufacturer. Improvements in the treatment of certain salts and oxides of manganese.

2477. Alfred Vincent Newton, of Chancery-lane, mechanical draughtsman. An improvement applicable to the reefing, furling, and unfurling of sails. A communication.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," November 4th, 1856.*)

1476. C. Mills. An improvement in the hammer rails of pianofortes.

1479. J. Saxby. A mode of working simultaneously the points and signals of railways at junctions to prevent accidents.

1485. S. S. Robson. Improvements in railway and other carriage breaks.

1491. M. Allen. An improvement in arranging and working the slide valves of steam engines.

1499. J. Kenyon and R. Kenyon. An improved fabric to be used in printing and other similar purposes, and a method of joining or connecting the ends of the same.

1502. J. Gratrix and A. Knight. Improvements in apparatus for registering a permanent record of the speed of steam or other engines, which apparatus is also applicable to watchmen's registers and other similar purposes.

1510. B. Scariano and R. P. de Villamil. Improvements in apparatus for measuring and setting out the forms of garments.

1511. W. Hudson and C. Catlow. Certain improvements in looms for weaving.

1514. C. A. Preller. Improvements in unhairing and preparing skins and in tanning. Partly a communication.

1518. G. H. Ormerod. Improvements in machinery for brushing and cleaning cotton fabrics.

1520. G. White. An improved poultice. A communication.

1521. E. Vincenzi. Improvements in Jacquard machines.

1536. C. W. Goodhart. Improvements in bars or gratings for the security of buildings and other property.

1539. J. C. Haddan. Improvements in the manufacture of projectiles, and in firing or discharging them from cannon.

1553. W. F. Spittle. An improvement or improvements in braiding or plaiting machinery.

1554. E. Green. Improvements in the manufacture of buttons.

1562. A. V. Newton. Certain improvements in machinery for manufacturing rope or cordage. A communication.

1649. W. Petrie. A new porous material for filters and other like articles, and for certain modifications or improvements in the manufacture of the material, whereby it is adapted to the formation of vessels of capacity, to be employed as a cement, as a water and acid-proof lining, as a preservative coating, and as a substitute for stone and earthenware.

1885. J. Cartland. A new or improved door spring.

1902. T. Bilbe. Improvements in the construction of ships and other vessels.

2076. S. W. Park and E. S. Ells. Improvements in machinery for knitting tubular ribbed fabrics.

2103. G. T. Bousfield. An improvement in flying or roving frames. A communication.

2136. K. Kline. The improvement of mariners' and other compasses, by which the effect of local attraction is cut off or neutralised, and the compass is made to traverse more perfectly.

2265. D. Law and J. Inglis. Improvements in moulding or shaping metals.

2283. C. W. Ramié. Improvements in constructing the permanent ways of railways.

2285. T. A. Dillon and J. Gray. An improved means for making signals on railway trains between the guard and driver respectively, and between the passengers and guard and driver, and of giving notice to the guard and driver in case of the accidental severance of the parts of a train, which invention is applicable also to steam ships, factories, and other places where it may be requisite to communicate with distant points.

2319. G. F. Wilson and A. I. Austen. Improvements in the manufacture of soap.

2335. A. Dunlop. Improvements in dressing or sifting flour or meal.

2348. G. F. Wilson. An improvement in the manufacture of rosin oil.

2368. W. Nairne. Certain improvements in the machinery for preparing flax, tow, and other fibrous substances.

2381. R. McConnell and A. Mackenzie. Improvements in supplying steam boilers with water, part of which improvements or modifications thereof are applicable for the transmission of fluids and the indication of fluid levels under pressure.

2392. G. Elliot. Improvements in the production of oxides of manganese.

2404. T. S. Cressey. Improvements in machinery for cutting, hollowing, and backing staves.

2414. G. Collier. Improvements in the manufacture of piled fabrics.

2423. E. Rogers. Improvements in apparatus for the decomposition and combustion of fuel.

2424. J. E. Reed. A mixture or compound for the cure of asthma, consumption, and other affections of the chest or lungs.

2430. J. McDowall. Improvements in sawing or cutting wood.

2434. A. V. Newton. Improvements in the manufacture of tufted pile fabrics. A communication.

2435. W. Gossage. Improvements in the manufacture of coal-gas used for illuminating purposes.

2443. L. J. Pomme de Mirimonde. Certain improvements in reducing the friction of axles and axletrees of carriages on railways.

2467. G. Blair. Improvements in the manufacture of looped fabrics.

2477. A. V. Newton. An improvement applicable to the reefing, furling, and unfurling of sails. A communication.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1853.

2508. Joseph Haley.
2514. George Hamilton.
2515. Anthony Park Coubrough.
2521. John Crowley.
2524. Mark Newton.
2528. James Chesterman.
2543. Henry Brierly.
2545. Richard Edward Hodges.
2549. John Moffat.

2552. Bryan Edward Duppa.
2573. Charles Carr and William Kyle Horsley.
2578. Edwin Kesterton.
2591. Humphrey Chamberlain.

LIST OF SEALED PATENTS.

Sealed November 1, 1856.

1042. William Naylor.
1054. Wright Garside.
1061. Amedée Louis Beudant and Jean Louis Marie Paul Benoit.
1062. Obed Blake.
1089. Alfred Vincent Newton.
1131. Henry Bragg, jun.
1139. Gustavus Palmer Harding.
1155. Samuel Weston Moore.
1169. Alfred Vincent Newton.
1193. William Cardwell McBride.
1217. William Galloway and John Galloway.
1221. William Churchill Dempsey.
1255. Charles Cowper.
1269. Frederick Peter Dimpfel.
1297. Henry Cartwright.
1338. John Betts.
1361. Alexander Robertson.
1381. Alfred Vincent Newton.
1563. John Pendlebury.
1634. Charles William Lancaster.
1685. Ebenezer Seymour.
1767. William Wood. [Kingston.
1899. Edward Hallen and William Holland
1928. John Stopporton.
2011. Edward Poitiers.
2055. George Alfred Lewis.

Sealed November 4, 1856.

1071. William Joseph Curtis.
1072. Ralph Heaton, jun., Harry Heaton, and George Heaton.
1079. Alexander Ebenezer Riddle and Isaac Hoare Boyd.
1090. Stephen Walter Underhill.
1095. Ferdinand Potts and Thomas Vann.
1117. Edouard Besnier de la Pontonerie.
1132. William Galloway and John Galloway.
1133. Hiram Groves.
1143. William Crofts.
1160. Joseph Martin.
1180. Jeremiah Brown.
1194. Alfred Vincent Newton.
1197. Joseph Henry Reyuell de Castro.
1207. George Heron.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

W. Truran, A Looker-on, and *J. Lotsky*.—The publication of your several letters is unavoidably deferred.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

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LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1736.] SATURDAY, NOVEMBER 15, 1856. [PRICE 3D.

Edited by R. A. Brooman, 166, Fleet-street.

THE BOAT ARMAMENT OF THE AMERICAN NAVY.

Fig. 1.

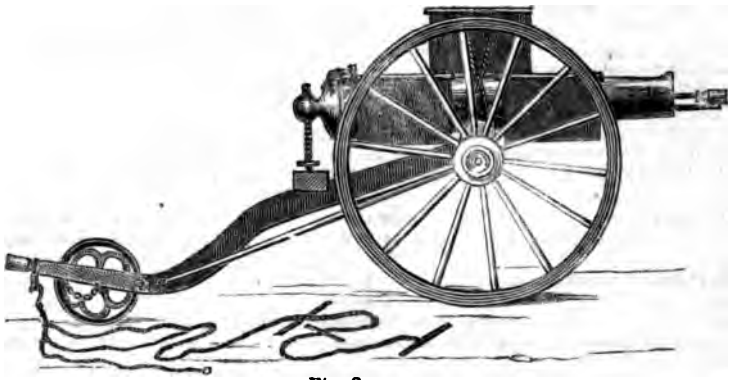


Fig. 2.

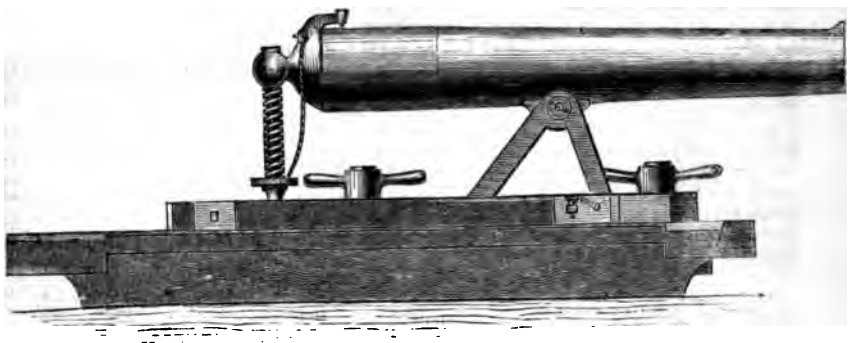
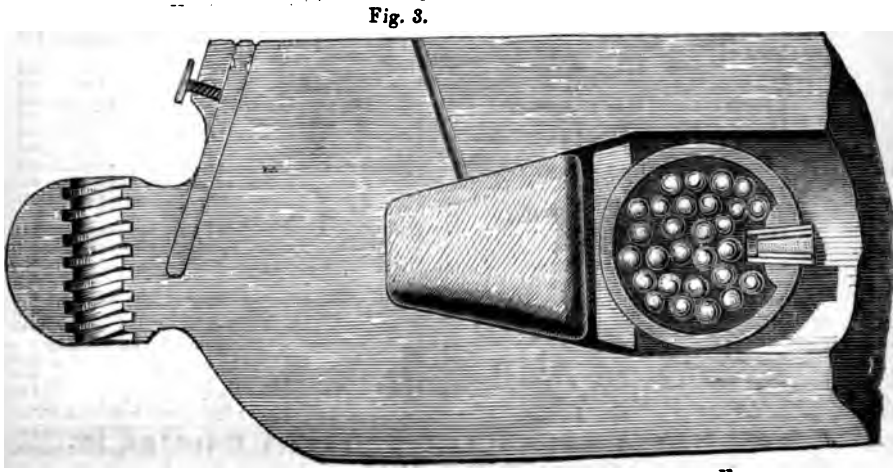


Fig. 3.



THE BOAT ARMAMENT OF THE AMERICAN NAVY.

In an article on the new American steam-ships of war, in our number for October 11, brief reference was made to the use of light wrought-iron gun-carriages for boat service. We find that opinions are divided with respect to the merit of these carriages, and much discussion has taken place upon the subject. For this and other reasons we think that further information respecting the armaments of the boats in the United States' Navy will be received with interest by our readers. In supplying this we shall ensure accuracy by deriving our information from the published papers of Commander Dahlgren,* who has charge of the Ordnance Department of the Navy-yard at Washington. This department has grown into importance since 1848 under his superintendence, and now includes a fine building, containing a considerable quantity of steam and other machinery, separate rooms for fitting shells, a foundry for casting bronze howitzers, &c.

The following are among the regulations prescribed by the Navy Department (December, 1850) for the furnishing of boat-guns and field-pieces for vessels of the Navy:—All boat-guns and field-pieces are to be of bronze, of howitzer form, and are to be chambered; they are to be of 12-pounder and 24-pounder calibre, and their greatest weights are to be 750 lbs. (and 450 lbs. for a lighter class) and 1200 lbs. respectively; ships of the line and frigates are to have one 24-pounder boat-gun, and one 12-pounder field-piece, with a suitable carriage for each; for each 12-pounder there shall also be a boat-carriage prepared, by which a field-piece and a boat-gun, or two boat-guns, as may be necessary, may be used.

The principal object of boats'-guns being to destroy life rather than material, howitzers are used (figs. 1 and 2†), and with them shell or shrapnel. The howitzers used in the various boats of the United States' Navy differ only in weight and dimensions. "In their design I have followed," says Commander Dahlgren, "the utmost simplicity of figure, and dispensed with all ornament." The piece is cylindrical around the charge, and tapers thence towards the muzzle. The breech end is of the form of a portion of a sphere. The bore is terminated by a conical chamber (fig. 3); the chief inducement for preferring this to the cylindrical form, in the case of these howitzers, being the greater facility it affords for rapid loading, without danger of failure in the ramming home of the charge. A screw is used for elevating them, and, for convenience in working rapidly, a light disc, coarsely milled around its edge, is used instead of a lever for turning the screw. The lock is a plain hammer perforated at the head, so as to permit free egress to the blast from the vent. It plays in a lug cast on the piece in the rear of the vent, and is so arranged as not to interfere with the pointing of the piece. A round tangent sight is made to move in a perforation drilled for the purpose in the rear of the base ring. No breechings for checking the recoil are used, being found superfluous; if the means used for the purpose (described hereafter) should ever be found inadequate, a thimble to receive a breeching can readily be fitted to the neck of the knob. The principal dimensions of the boat-howitzers are as follows:—

	24-pounder inches.	Medium 12-pdr. inches.	Light 12-pdr. inches.
Diameter of bore	5·82	4·62	4·62
True windage	·10	·10	·10
Bore { length including chamber ..	58·20	55·23	44·00
Bore { in diameters	10	12	9½
Chamber, length	6·00	5·23	5·23
Length from B, R to muzzle-face ..	58·20	56·23	45·24
Diameter of cylinder	11·42	9·00	8·00
Ditto chase	8·82	7·24	6·42
Length of cylinder	15·00	12·00	10·00
Ditto chase	43·20	44·23	35·24
From base ring to axis of loop	23·75	24·60	18·78
Hole in loop, length	7·00	5·00	3·60
Ditto diameter	2·50	2·03	1·50
Weight	1310 lbs.	760 lbs.	430 lbs.

Each of the boat carriages (fig. 2) is composed of three principal pieces—the bed which carries the howitzer, the slide on which the bed moves, and, beneath the slide, a wooden plate connected with the bed by two stout bolts. The recoil is controlled by compressing the slide between the bed and the lower plate; for which purpose the bolts connecting the upper and lower pieces have a thread above, and a corresponding nut with handles. These are set as firmly as the strength of an ordinary man can set them, and suffice to keep the

* Particularly "Boat Armament of the U. S. Navy." Philadelphia: King and Baird. 1856.
† Preceding page.

recoil within the limits of a slot in the slide. After the discharge of the piece, the compression is relieved, and the piece is run out. When the carriage is new, the sliding surfaces occasionally require adjusting, owing to the warping and twisting of the material of which they are formed. The efficacy of this method of receiving the recoil may be judged of from the fact that although, in a certain instance, when a 12-pounder was mounted rigidly in a frigate's cutter 27½ feet long, with twelve persons in it, besides gun, ammuni-

Fig. 4.

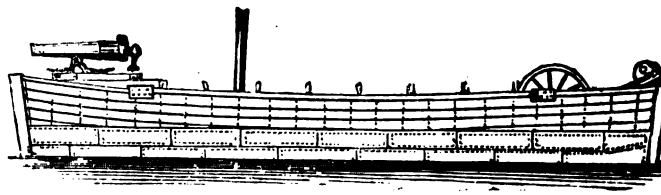
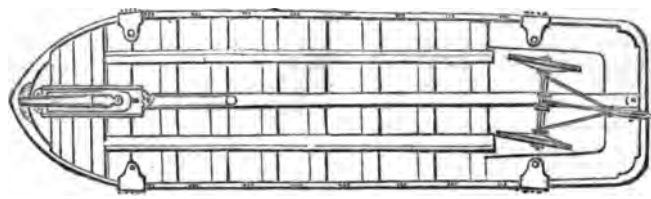


Fig. 5.



tion, oars, &c., the cutter was driven back by the recoil many yards astern; yet no injurious effect whatever was produced upon the boat—even the paint upon the plank-ends being undisturbed—when the same piece was mounted upon its own carriage, and discharged a hundred times while the boat was under full way. Commander Dahlgren says, "The greatest rapidity with which it is desirable to deliver the fire of light pieces is attainable with this mode of mounting," and Lieut. Decamp states that, in shelling an African village, the howitzer was fired from the launch at the rate of five times in the minute."

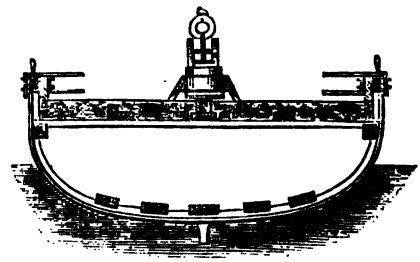
We now come to the wrought-iron field carriages (fig. 1), upon which the 12-pounder of 750 lbs. is mounted when disembarked with parties of seamen for land service. These carriages are the result of great care and trouble, much difficulty having been experienced by the designer in retaining the necessary strength while reducing the weight to the least limit. The trail has a small wheel or runner to ease it over any obstacle, and it is found preferable in draught to attach the drag-rope to the trail. The carriage weighs rather less than 500 lbs., and with its piece is drawn readily by the force always disposable from any boat that could carry a gun of this class. The parts of the carriage are held together by screw nuts, so that no difficulty ought to arise in taking it apart, if desirable to do so. The axle or pin of the trail-wheel is to be drawn out, and the wheel itself turned up on the trail, in order to moderate the recoil on smooth ground. No limbers are used with these carriages, it being assumed that, for every safe and judicious movement of seamen on shore, the ammunition slung under the axles, and carried in the pouches of the men (about seventy rounds each gun) would fully suffice. When more than a single piece is landed, and a march anticipated, the trail of one field carriage is secured to the axle of another.

The projectiles used in howitzers are shells and canister, to which it is now usual to add shrapnel of an improved kind. In the new plan the balls are more closely packed than formerly, and the interstices filled with sulphur, which solidifies and imbeds the balls, so that they cannot move, and the interior of the shrapnel is thus filled solidly. A cylindrical cavity is also left, the axis of which coincides with that of the shrapnel axis, and which passes through the fuse hole, extending across the interior. In this cavity is deposited the charge of powder, where it is protected against all injury and liability to premature explosion, from the movement of the balls. By this arrangement the quantity of powder required to open the shrapnel is much lessened, the new plan requiring only ⅜ths of an ounce, or an ounce, while with the loose balls 4 oz. are required. The fuze employed is Colonel Bormann's, of the Belgian Artillery. It is composed of a metallic disc, about 1·6 inches in diameter, and ¼ inch thick, made of lead hardened somewhat by the infusion of some tin. *On its exterior* are screw threads, by which it is screwed into the shrapnel *case. The fuze composition* is firmly condensed in an interior canal of this disc opening

below, and closed, after the composition is driven in, by a small slip of soft metal driven in upon it. The upper surface of the disc is thin enough to yield readily to a cutting tool, by which it is opened. Outside the disc is graduated to seconds and fourths of seconds. The end of the composition where the graduation begins opens into a small magazine at the centre of the disc, and this magazine is charged with grained powder, and slightly closed on the inner side so as to yield in that direction to the explosions. The charges of the boat howitzers are:—24-pounders, 2 lbs.; 12-pounders, medium, 1 lb.; 12-pounders, light, 0·625 lbs. In terms of their heaviest projectiles, the weights of these pieces are, 24-pounders, 55; 12-pounders, medium, 63; 12-pounders, light, 36.

Fig. 6.

Fig. 7.



The appliances for mounting the howitzers in boats will be best understood from a description of a frigate's launch, fitted for actual service (figs. 4, 5, 6, and 7.) This boat is 34½ feet in length, and has an extreme breadth of 11½ feet. The boat carriage is so placed in the bow as to carry the muzzle of the howitzer just above and clear of the gunwale and stem. Two pieces of yellow pine are laid athwartships, so as to bear the carriage at this height, and on them it traverses when pivoted at the stem. The warping chocks at the stem and stern-post should be arranged so as to be moveable when the gun is used. The two iron plates for receiving the slide are welded into one piece, which is firmly bolted beneath the breast hook of the bow. When pivoting on the stem or stern plates, the howitzer has the sweep permitted by the form of the boat. Two pivot plates are bolted on each bow, so that the howitzer may be trained more or less on the beam, the stem plates being adjusted first, and the carriage fitted in. The distances between the bolt of the stem plate and that of either bow pivot must be equal to the distance between the holes in each end of the slide, and the pivot bolts of the two bow plates also correspond to the same distance. The pivots are thus at the points of an equilateral triangle, which provides for a rapid and certain management of the gun in changing its position. To sustain the carriage in sweeping, when pivoted to the bow, a piece of yellow pine scantling is placed lengthwise and amidship, mortised into the after cross piece. The arrangements for the stern are adapted to the same principle.

THE PATENT OFFICE LIBRARY.

THE Vacation having now ended, and the Commissioners of Patents having returned to town, we hasten without further delay to bring to their notice a matter which demands their immediate and earnest consideration, viz., the contemptible character of the apartment now named the Patent-office Library, Southampton-buildings, and the urgent necessity of providing another more commensurate with the objects in view when the establishment of such a library was decided upon, and with the *requirements* which experience has proved *to exist.*

With the introduction of the Patent-law Amendment Act of 1852, new and comprehensive proceedings were commenced under the direction or sanction of the Commissioners, such as the printing of all specifications of patents, the compilation of copious indexes, and the provision of a public library in which specifications of patents might be examined free of charge, and where works of science might be gradually collected for the use of all who chose to avail themselves of the facilities thus afforded. With the aid of their earnest and judicious officer, Mr. Bennet Woodcroft, the Commissioners have proceeded admirably with the printing of the specifications, the publication of the in-

dexes, the opening up of communications with foreign patent offices, and the collection of valuable scientific works, &c.; but the delay in obtaining a suitable building for the library, is bringing disgrace upon the whole system. The present apartment is about three or four yards square! It would be considered by most persons too small to put half-a-dozen clerks in, and yet it is deemed proper to continue to use it as a public library, and that, too, of the most important character; for there is not a class library in England of so much importance, or which should be of so much importance as the library for inventors. The room does not and will not contain a tithe of the volumes which the Commissioners already have, although the walls are covered with books, the tables heaped with indexes, and the floor paved with specifications of patents. Persons (some of whom are ladies) come to the place, often from afar, open the door, look in with bewilderment upon a little crowd of individuals elbowing each other's sides, closing each other's books, sweeping away each other's papers, and apologizing all round, and they turn away disappointed and annoyed. And all this is for the want of *mere space*. At present we ask for no more than this. When we think of the revenue derived from patents, the importance of inventors as a class, and the lead we are taking of foreign countries in patent matters generally, we know that we might fairly ask for the erection of a new and splendid structure as a national Patent Office. But, just now, we ask not for magnificence, but, as we have said, for mere space.

It has been said by some that a patent-office library would be but little resorted to. The objection is fully met by the fact that even now, while the library is a gloomy cellar, or but little better, there are more visitors than can find admittance. Let the public find ease, convenience, comfort, and reasonable facilities in such an office, and their attendance will more than dispel the doubt. If the Commissioners will attend to facts, rather than to the croaking of the dismal or the interested, they will no longer delay the change we ask.

There is one other circumstance which deserves their notice. Before they send gifts of printed specifications, indexes, &c., to the various towns, they stipulate that there shall be provided a suitable place in which such works may be freely inspected by any of the public. Is it consistent, then, to turn the public from the doors of their own metropolitan library for want of the necessary accommodation? We will close these observations with the suggestion that, when the commodious library is provided, it must not be closed at 4 P.M. There are many inventors whose leisure falls later in the day, and 10 P.M. would be sufficiently early to shut the doors. Of course, the business offices would close at the usual time.

THE DECIMAL SYSTEM.

THE TEN ESSENTIALS OF A COMPLETE DECIMAL SYSTEM OF MEASURES, WEIGHTS, AND MONEY.

First. There must be a measure of length that will admit of the utmost portability, and facility of use as a mechanic's rule. The present foot rule, the old French pied, and the new French pied, may be taken as examples of such a measure; the first rather too short, and the last rather too long. The French metre, being 39·37 inches long, can only be folded in lengths of 19·68, and 3·94 inches, without breaking a cardinal measure; and is nearly as inconvenient a length as could possibly be. Sweden has just adopted a decimal system of measures and weights. The Swedes have decimally divided their old foot, and, in doing so have committed a grave error. It contained 12 inches, and 144 lines. If they had added 6 lines more to the length of it, and so made it to contain 150 old lines, then all the old inches, and the old foot, would have been represented on the new rule, and every even number of lines new, would have coincided with old lines, the foot rule would have been much improved in length, and its cube increased from 1593 to 1852 cubic inches English; materially improving the bushel measure.

Second. Whatever subdivisions of the measure of length are likely to be used as dimensions of manufactured articles should have distinct names, and not be written down, and spoken of, as fractions. Our smallest measure of length is an inch, for the barleycorn was never used as a measure, and can only be found in tables of measures, and why it should be found in them it would be difficult to say. If a foreigner wanted to find the divisions of our foot rule, he would naturally conclude, from our tables, that we divided our inch into three parts. Of what use is it to remind every urchin at school that "three barleycorns make one inch," except it be intended to puzzle him to know whether the foot was originally found from the length of a man's foot, or the length of thirty-six barleycorns? He is never told, what might be useful for him to know, that the inch is divided binarily, to the smallest divisions required in practice. It would be a great improvement to call the eighth of an inch an "Aet." 5 ae. 7 ae. would be better than $\frac{5}{8}$ of an inch, $\frac{7}{8}$ of an inch, or 0·625 inches, and 0·875 inches. If

the Aet were again divided into ten parts, with a name for them, it would be still better.

Not only should the small divisions have names of their own, and thus be made cardinal measures, but there should be altogether such a number of these cardinal measures as would enable us to avoid fractions on the one hand, and a great number of figures on the other. Ten being a decimal number *par excellence* offers a good limit to the number of denominations in a decimal system. The smallest measure that the French can express without a fraction is the millimetre; which is not nearly small enough even for mechanical purposes. To express the dimensions of the sheet metal and wire gauges, would take two places of decimals in the metrical system, while for scientific purposes, which the *savans* certainly should have had in view, it is most defective, as the following small table will show. The dimensions are given approximately in English inches, French millimetres, and Victorian measures, with the prefixes proposed to be used for scientific purposes.

	ins.	min.	
Thickness of gold leaf.	0·000004	0·00002	3 milliteks
,, silver leaf.	0·000007	0·00004	7 ,,
,, spider's thread.	0·00003	0·0001	2 centiteks
,, silk.	0·0002	0·001	16 ,,
,, wool fibre.	0·002	0·01	2 teks

Third.—The measures of surface should all be formed from the square of the measure of length; so that length multiplied into breadth would express the measure of surface at once. Distinct names should be given to quantities sufficiently small to avoid fractions in ordinary mechanical dimensions. For example, the fire grate and heating surface of a boiler per horse power. At present, we are compelled to use two decimal places; 0·65 square feet, grate surface, and 16·85 square feet, heating surface, are instances. The French are not in the least degree better off than we are in this respect, whether they use the metrical system or the new *pied*. In the Victorian system, such quantities would be given as 42 ck. and 1178 ck.; fractions are thus avoided, and also the term square.

Fourth.—The measures of bulk should all be derived from the cubature of the measure of length; so that length, breadth, and depth, multiplied into each other, would give the measure of bulk, in corresponding denominations, gallons, bushels, &c. There is no necessity whatever for any distinction between the measure of a bulk of corn, and a bulk of ale, timber, earth, or stone. Whatever denominations are used, they in all cases represent a certain bulk; and there can be no occasion for a bushel of corn, and a firkin of beer, in a thorough decimal system.

Fifth. Amongst the measures of bulk there must be one well suited to the uses of the farmer and corn merchant. It must not be so large that men cannot lift it up, so as to empty it into a sack, and keep on at it for a working day, nor so small as to be tedious in using. It fortunately happens that there is such a relation between the rule and the corn measure, that the cube of the best rule makes a good bushel, and the cube root of the best bushel makes a good rule. The best length for a rule is about 12½ inches; the cube of this will give over 1,953 cubic inches. The old standard at Guildhall contained 2,146, and the Winchester 2,150 cubic inches; these may be considered as good examples. The French decalitre contains about 610, and the hectolitre 6,100 cubic inches, both, beyond all proportion, out of the way, and about as far from a good corn measure as could possibly be.

Sixth. The weights should be derived from the measures of bulk, filled with water; so that the product of length, breadth, and depth of a bulk of water would give its weights as well as measure; and also the cubical bulk of solids, multiplied into their specific gravities, would give their weights.

Seventh. The standard weight should be made equal to its proper bulk of water when weighed in air, at its mean pressure and temperature, so far as practicable.

Eighth.—The material of the standard weight should be, as near as practicable, of the specific gravity of the material of which ordinary weights and measures are made; so that, when used as a test, a slight variation in the pressure of the atmosphere would not be of much consequence.

The French make their standard of platinum; and the kilogramme is the weight of a litre of water, weighed in vacuo, at the temperature 4° centigrade, about 39·5° Fah. The result is, that a litre of water weighed in air, at its mean pressure and temperature, will not weigh a kilogramme, but only about 0·9983 of a kilogramme. A French engineer making his calculations of the weight of water in tanks, pumps, pipes, passing through orifices, over weirs, &c., must, after finding its bulk, multiply by the number 0·9983. This number must also be used in finding the weight of bodies from their bulk and specific gravities.

Ninth.—If alloy be used in the coinage, it should be a decimal part of the whole composition.

Tenth.—The standard of value coin, should be of the weight of one of the denominations of weight; so that the same figures which gave the weight of a piece of the standard metal, would also give the value of it.

These are the conditions to be kept in view during the formation or discussion of a decimal system. In merely altering so much of the old measures as will make them decimal, it may be altogether impracticable to comply with the whole of these conditions. It is for those concerned to make the best arrangement of the materials they have, always bearing in mind that a system of measures, weights, and money must be made to suit the whole people, and not merely a small section, however powerful that section may be.

A decimal system is only superior to a non-decimal in its insuring greater accuracy, and taking up less time in making calculations. Therefore those who advocate a decimal system must be advocates for time saving. But it is possible for a system to save time in reckoning, and lose a far greater amount in the actual use of the measures and weights. The advocates of time saving could not consistently advocate a system that would do so. It has been proposed to make a bushel equal to the cube of our present foot; it would, therefore, contain 1,728 cubic inches. A Victorian bushel contains 1,953 cubic inches; therefore in filling and emptying the bushel into a sack, and carrying the sack from the ship to the warehouse, these things would have to be done 19 times with the foot bushel, to 17 times with the Victorian bushel. It would not be too much to put down the loss of time and money at one shilling in twenty.

It has also been proposed to found a decimal series of bulk measures on the present gallon; but a bushel of 10 gallons, or one quarter heavier than the present one, would be impracticably heavy.

With respect to the coinage, though arithmetic may prescribe a decimal portion of alloy, chemistry may forbid it, as being incompatible with a sufficient degree of hardness. And the present value of the precious metals forbids a coin of account being a cardinal weight, without foregoing some of the other conditions of a decimal system. If the French had made their franc just twice its weight, it would then have been a decagramme, and the centime would have been a coin fit to be coined and used, as it would have been 0·8 of a farthing instead of only 0·4.

What we have to do is, to determine the relative importance of those conditions which clash, and determine accordingly. We must make our choice between making the sovereign a quarter of an ounce, and the cubic ped of water 100 libes, or making the sovereign a drame, or tenth of an ounce, and the cubic ped of water 40 libes. I most decidedly prefer the latter, and propose the *following as the* best way of proceeding to make a decimal system of measures, weights, and money for England and her colonies, and one well worthy the adoption of our cousins in America.

The sovereign contains $\frac{1}{12}$ of alloy, or 8⅓ per cent. I would make the amount centesimal, by the slight alteration from 8⅓ to 8½. Then with the atmosphere at a pressure of 30 ins. or 24 enks Victorian, and at the temperature 10° centi or 50° Fahr., being the mean temperature of the earth, I would declare so much water as would weigh 4,000 sovereigns to be 40 libes Victorian, to be a cardinal measure of bulk, and the side of a cube to contain it, to be a Victorian ped or foot. This ped to be divided into 100 aets, we should then have the aet equal to 1·00046499 eighths of an inch. The ped would thus contain 100 eighths of an inch, instead of only 96. These being done, all the other conditions, not affected by the alteration, to be strictly carried out.

Our silver coins contain 8$\frac{4}{37}$ per cent. of alloy, I would change to 8½. Then a florin would weigh 142·8781 new grains. It will be seen how near this comes to $\frac{1}{7}$ expressed decimally 0·142857, &c.; so that by making the florin 0·02 of a grain lighter, we should get 7 florins, and also 10 sovereigns to the ounce. 16 mils to the ounce would give us copper at 1*s.* 9½*d.* per lb. The postage of letters, instead of being charged by the half ounce, would be charged by the two drames, or two sovereign weights, which at present rates would be 4·705 mils. If this were increased to 5 mils, the revenue would gain 0·3 of a mil on some letters, and would lose on many escaping double and triple postage. In the end there would be neither gain nor loss either to the public or revenue.

If these alterations were to become law (a few years after the passing of the Act), we would have the value of standard gold always expressed by the same figures which gave its weight; and all measures now expressed by the foot, inch, and its divisions, would be expressed in the new measures to within the $\frac{1}{2500}$ of the whole.

J. Simon Holland.

GREAT BRIDGE AT MONTREAL.

This immense structure, forming part of the Great Trunk Railroad of Canada, has been pushed forward with considerable energy this summer by A. M. Ross, the resident engineer; but even with the greatest efforts, it is believed that it cannot be completed within two years. And when its gigantic proportions are taken into consideration, this will excite no wonder. The mason work alone will amount to 28,000,000 cubic feet, and the iron tubing will weigh

11,000 tons. When completed it will be the greatest bridge in the world.—*Scientific American.*

FACTS AND FANCIES.

If we would be successful students in natural philosophy, we must be careful to distinguish between a fact and the language in which the fact is announced. If this principle be neglected, the student may learn much that will only add to his ignorance. In natural philosophy, facts are very commonly recorded in the language of theory. To be accurate in our philosophy, we must be skilful analysts to separate the fact from the theory. A fact is always valuable, and a theory is of little good until it merges into a fact. Philosophic language is, at least, one-half theory, and therefore may be one-half fiction. We scarcely ever meet with a fact without at once taking up a theory. Human nature craves for a cause. Hence the uneducated mind is tempted to become superstitious. Ignorant of the vast resources of what we call "Nature," the untaught observer speaks of facts in the language of superstition. Diabolical or angelic agency is thus made to account for startling appearances in the natural world. The gas which is emitted from stagnant pools, and ignites spontaneously, is looked upon as a lamp carried in the hands of a malicious spirit, seeking to allure the benighted traveller into some dangerous swamp. Hence the warm fancy of the Oriental mind considers the falling stars as blazing torches, cast from the hands of good angels to drive away the spirits of the abyss when the latter strive to approach the gates of heaven. In this way it has come to pass that some men conclude ignorance to be the mother of devotion. At the same time we consider devotion and superstition to be two very different things.

But false theories are not confined to the unlearned. The man of science has his fancies, and he calls them theories or hypotheses. And oftentimes there is such a jumble of facts and fancies, that science is found to be associated with almost as much error as ignorance itself. Science has its superstition and its dreams, and philosophers are often as visionary as poets, though without their fervour. Take an example:

"If either pole of a magnet be brought near any small piece of soft unmagnetic iron, it will be found to attract it."

We extract this from a very sober philosophical treatise, and we suppose most people would take the sentence as a correct statement of a philosophical fact. Many would take the presumed fact, and would proceed to theorize for themselves. But, in reality, they would be theorizing upon a theory. We are told that if the above circumstances are observed, the magnet will "attract" the iron. The student takes this "attraction" for a fact, and proceeds to set up a theory to account for it. But we should like to understand, first of all, what is meant by the word "attraction." It is purely a theoretical word, and is not at all needful for the enunciation of the fact which is to be described. The bare fact is this—that the iron will be found to "approach" the magnet. The philosophic mind inquires, "Why does the iron 'approach' the magnet?" A theory is started at once, and we are told that the approach takes place because the magnet "attracts" the iron. Thus our presumed fact is half theory. Before we theorize, we should get rid of theory, and should theorize upon facts. It is one thing to consider why iron approaches a magnet, and another thing to investigate the merits of that wide-spread theory of "attraction" which pervades our modern philosophy. This "attraction" is only a scholastic cloak to hide the old poetical theory of a "secret sympathy." The hypothesis of attraction may be true, but it may not be. On the other hand, we know it is true that if either pole of a magnet be brought near any small piece of soft unmagnetic iron, the latter will approach the magnet.

The use of theoretical language in describing natural facts, is very convenient as a system of artificial memory. A theory is a handy thing to string facts upon. But when we unconsciously use a theory as we would an actual fact, our reasonings are at once jeopardized, and our inquiries cease to be independent. Let us, then, if we please, use the language of theory, but not abuse it. And let us be upon our guard, lest we exalt our fancies into facts. J. Pitter.

ROCK'S IMPROVED OMNIBUS.

We are glad to find that the improved omnibus, patented by Mr. James Rock, jun., in 1850, and exhibited by him (jointly with Mr. Green, the builder) at the Great Exhibition of 1851, has now been adopted by the London General Omnibus Company. Several new omnibuses, constructed with Mr. Rock's improvements, were inspected and much commended by the Lord Mayor and the civic authorities on Thursday last, at the Mansion-house; and it is to be hoped that the London General Omnibus Company will lose no time in giving to the public a sufficient number of those really comfortable conveyances.

The chief feature of the invention consists in constructing the sides of the omnibus so as to give six or seven inches more width to the interior without enlarging the external dimensions of the body, or increasing the width of the track of the wheels—points of great importance both as regards

the draught of the horses and the traffic of the streets.

Mr. Rock did not put in his plan to compete for the £100 prize, offered by the London General Omnibus Company.

WARSAW WATER WORKS.

We learn with much pleasure from Warsaw, that the Emperor Alexander has presented Mr. John Head (eldest son of Jeremiah Head, Esq., of Ipswich) engineer of the water works in that city, with a magnificent gold ring, set with eight diamonds, accompanied by a letter thanking him for the zeal and energy which he has displayed in the construction of these works.

The engines were manufactured by the Messrs. Ransomes and Sims, of Ipswich, under the superintendence of their late engineering manager, Mr. Henry Warriner, and consist of a pair of high pressure, condensing, expansive beam engines, of forty horse power; their superior construction and excellent finish have elicited the highest encomiums from numerous scientific gentlemen who have inspected them.

JUCKES' FURNACE BARS.

Heretofore when furnace bars have been in short lengths and made into a continuous chain, they have not admitted of one bar being replaced by another, without considerable inconvenience; but the chain of bars has had to be divided across in order to take out the bars when broken, worn, or injured, in order that they might be replaced by others; and this was because of the transverse pins or axes (which coupled the short bars into a cham) being of a cylindrical form, passing through circular holes in the bars. Mr. Juckes, of Islington, the patentee of the revolving furnace, has recently introduced an improvement which consists of making the circular holes in the bars with narrow outlets below, and in employing transverse pins or axes with the sides reduced or cut away, so that the diameter of each in one direction may be less than in the other direction, the larger diameter agreeing with the diameter of the holes through the bars, and the smaller diameter agreeing with the outlet, thus admitting of a bar being removed when such axes are placed and held in one direction, but not admitting of the bars being removed when the axes or pins are turned in the other direction.

BESSEMER'S NEW IRON PATENT.

Court of Chancery, Lincoln's-inn, *Nov. 7.*

Before the Lord Chancellor.

RE BESSEMER'S PATENT.

This was a *petition by Henry* Bessemer, who claimed to be the inventor of the celebrated new process for smelting iron, and it prayed that the great seal might be affixed to a patent taken out by him in May last, securing to him the sole right of using the invention, notwithstanding that a caveat had been entered against such sealing. It appeared that the caveat had been entered by Mr. Birch, the manager of the Bowling Ironworks, upon the allegation that the invention had been already patented by him, and had been in use for a year and a half in the manufactory of which he was the manager.

Mr. Malins and Mr. Hallett, for the petitioner, contended that the two inventions were essentially different. The main feature of Mr. Bessemer's invention was that pig iron was converted into malleable iron capable of assuming any shape by one smelting, whereas by the process of Mr. Birch the iron had to be subjected a second time to the fire to obtain the same result.

Mr. Cairns and Mr. Webster (of the common-law bar), for Mr. Birch, urged that the two processes were practically the same, and went very fully into an explanation in detail of them to prove that such was the case.

The Lord Chancellor deferred judgment till the following Tuesday (Nov. 11), and then ordered the patent to be forthwith sealed, and the specification to be filed on or before 30th December; it being his opinion that there was much in Bessemer's specification which was not to be found in Birch's. There was no order as to costs.

BEATTIE'S RAILWAY-WHEEL LATHES.

Court of Queen's Bench, Westminster, *November 6*, 1856.

Before Lord Campbell, and Justices Coleridge, Wightman, and Erle.

BEATTIE *v.* THE LONDON, BRIGHTON, AND SOUTH COAST RAILWAY COMPANY.

Mr. Bovill, Q.C., with whom was Mr. Aston, moved for a rule for a new trial in this case upon the ground of misdirection, and that the verdict was against the evidence. The action was brought to recover damages for the infringement of a patent granted to the Plaintiff so far back as 1840, among other things for an improved lathe, to be used in the construction of wheels for railway carriages, whereby two wheels might be turned and bored at the same time. The jury found a verdict for the Plaintiff, and gave as damages the amount usually charged by him as a royalty—viz., 10 per cent. on the cost of the machine. The learned counsel now contended that, according to the evidence, the invention was not new; and, secondly, that the mere use of the machine by the Defendants would not constitute an infringement.

Lord Campbell said, he was not so satisfied with the verdict but that he should like to have it tried before his learned brother, Mr. Justice Erle. The learned counsel might take a rule to show cause.

It was stated that the Plaintiff had made no complaint until after his patent had expired, and that he had now brought actions against nearly all the railway companies in England.

Rule *nisi* granted.

PATENT WOOL-COMBING MACHINERY.

SAME COURT AND JUDGES AS PRECEDING CASE.

LISTER *v.* LEATHER.

The Attorney-General said, that in moving for a new trial in this case, which was an action for the infringement of a patent for improvements in machinery for wool-combing, he feared he should have occasion to refer to the machinery, and he applied that he might be allowed to make his motion in the morning, when the machinery would be in court.

Lord Campbell said, the court could not do otherwise than accede to the request.

The application was made in the morning at the sitting of the court, and the rule granted.

SMITH'S PATENT TOYS.

COURT OF COMMON PLEAS, WESTMINSTER, NOVEMBER 6, 1856.

Before Mr. Justice Cresswell, and Justices Williams, Crowder, and Willes.

SMITH *v.* NEAL.

This was an action tried before Mr. Justice Willes, when a verdict was found for the plaintiff—damages 75*l.*

Mr. Norman now moved for a new trial on the grounds of misdirection. The action was brought for the nonpayment of a second instalment of an agreement price to be given for a patent for making toy chairs and tables for children from wire covered with a kind of cement, which the defendant, as the director of an institution called the Ladies' Guild, agreed to purchase from the plaintiff, a young lady who had patented this invention. The learned counsel now submitted that the verdict was against the evidence, that the agreement had never been reduced into writing, and as it was not to be performed within a year it was within the Statute of Frauds; that the patent was not a valid patent, and that the specification was too large.

The Court, as to some of the points *urged*, granted a rule *nisi*.—Rule nisi.

BESSEMER AND MARTIEN.

To the Editor of the Mechanics' Magazine.

SIR,—In his letter of the 21st ult., Mr. Mushet adopts the tone of a much injured individual, and labours hard with his pen to mystify the Martien and Bessemer question so as to divert attention from his present ridiculous position. With this object in view, he has made free with my name, and I must crave a corner in your Magazine to expose a few of his misrepresentations on this irony subject.

That remarkable document, the Bessemer Manifesto, appeared in your number for August 16th. Mr. David Mushet was so overjoyed at its appearance, at the inflated language, so much like his own lucubrations, and at an opportunity of showing his vast wordy knowledge of iron making, that he could not resist the temptation of writing something on the subject: under date of the 18th of the same month, he relieves himself of these encomiums. It is impossible to doubt the veracity of the late statements made by Mr. Bessemer before the British Association. "The success of the new process will react upon the management of the blast-furnace, and render unnecessary the present wasteful system of manufacturing forge iron for the puddling furnace. This and the refining will be superseded with a vast economy in all branches of the manufacture." "I am always eager to express my sense of great merit."

Mr. Avery steps in the day after this was penned and claims for Mr. Martien the honour of first inventor and patentee of the process described by Mr. Bessemer. Mr. Mushet, as if determined to show his entire ignorance of the matter on which he wrote, replied to this in the following passage: "But I really do not think Mr. Bessemer is in any danger. The blowing of air into melted iron in the puddling-furnace, in the blast-furnace, and elsewhere, is not new. Whatever is the object of Mr. Martien's application of it, we cannot suppose he had the least conception or forecast of the object for which Mr. Bessemer applies it; for no man with a mind possessed with the great idea of so great a discovery could have been occupying his time and money in attempting to realise the precarious process of manufacturing malleable iron direct from the ore, first attempted by my late father sixty-two years since, and imitated and reimitated in the interval by countless patentees. I have for some months been very kindly invited to witness Mr. Martien's operations at the Ebbw Vale Works, and everything was nicely arranged for me, had not other engagements hindered my visit. I should, of course, have liked to see

how it was managed at such important iron-works, but I must candidly confess I did not entirely regret being detained away. I had no wish to be placed in a position to be compelled to discourage or to sanction, by my presence, operations in which I had no faith, and could not render any service —the more as I had expressed my opinions pretty explicitly on the whole subject in the *Mechanics' Magazine*, and the *Journal of the Society of Arts*. With the sense I entertain of the value of Mr. Bessemer's most novel and overwhelming invention, I hold it to be quite impossible that any man having the slightest glimpse of the real purpose of forcing air into liquid iron could have occupied a single day in the slow work of the old deoxydising furnace, however varied. Mr. Bessemer's process is so transcendent in merit that he ought not to be hindered by any trivial regards whatever. I can feel no delicacy now in discouraging what is entirely annihilated."

I will make one or two observations on this remarkable specimen of egotism. It will be seen that Mr. Mushet distinctly claims for his late father the merit of first attempting the manufacture of malleable iron direct from the ore. This he has since repeatedly denied, and in his last letter has a long preface on the different modes of making iron, in order to divert attention from the real point in dispute. He now states that it was the Renton process to which he referred, but neither in this letter nor in any one preceding it is there any mention made of Renton or his process, and it is now too late for him to qualify his statements at my expense in the manner he has done.

The "be compelled to discourage or sanction by my presence" "operations in which I had no faith," displays that silly egotism so characteristic of Mr. Mushet. Evidently he labours under the delusion that his good or bad opinion of an invention is a matter of vital importance to the inventor. His hallucination extends so far as to believe that his very presence near an experiment would be construed by the public into a proof of its great merit. His absence from an experiment, he fondly imagines, is taken as incontestable evidence of the worthlessness of the invention. Observe, also, how complacently he mentions that everything was nicely arranged for his visit. He has a full sense of his importance, and doubtless stipulated for a very flattering reception from the mountaineers; but the preparations made were not to his liking, and he stopped away. With praiseworthy compassion on the "small deer" of inventors (I use his own words) this would-be-important personage informs us that he can feel no "delicacy now in discouraging what is entirely annihilated." This claiming possession of delicacy of feeling, when annihilating, as he imagines, poor inventors, is a fitting termination to such an exhibition of conceit.

Although advised by Mr. Avery to the effect that Mr. Bessemer had no *locus standi*, he continues singing the praises of this gentleman in preference to those of Mr. Martien, for reasons best known to himself. A month after the publication of Mr. Avery's letter, and twelve days after Mr. Mushet had been in direct, and as we now learn *convincing*, communication with Mr. Martien, we were favoured with a new version of the whole affair. What the nature of the direct communication with Mr. Martien was, we are not informed, but, in consequence of the preliminaries occupying twelve days, we may justly infer that the negotiations respecting the terms on which his services were to be transferred to the enemy, were somewhat complex. Guessing, however, at the nature of the convincing argument which could work such a change in Mr. Mushet's views, let us look at his second edition of the incomparable invention.

Mr. Bessemer's manifesto is headed "manufacture of iron and steel without fuel." Mr. Mushet, throughout, treated it as such; his opinion, on the 28th August, being "as for cast steel, that is likely to be as common as cast iron." Now, when he entered Mr. Martien's services, all allusion to the wrought iron and steel without fuel, was dropped, and we are deluged with praises of an invention for refining crude iron, without fuel—a very different affair to the Bessemeric process; for, although the appliances used are not very dissimilar, the one claims the production of malleable iron and steel as the result of the process, the other claims finer's metal as the product. If we allow that Mr. Mushet began to praise Mr. Bessemer, as he now affirms that he did, before he knew of Mr. Martien's prior claims to the invention, it nowise helps him out of his position; he has yet to account for the glaring change of opinion as regards the nature of the product—at one time vehemently asserting that it was malleable iron and cast steel, and now, without a word of explanation, that it is merely finer's metal. A man may change his employment as often as he thinks proper without suffering in reputation, but the frequent change of opinion in scientific, as in other matters, is tolerable evidence of his lacking principle and firmness.

The attempt to explain away his error in regard to the first inventor, is quite in

the Mushet style. An extract from his last letter will suffice for the present. Alluding to the Renton process, he states, "It was this I was invited to see, being the only iron-making process that I knew M. Martien was engaged in until I read Mr. Avery's claim in the *Mining Journal*, Aug. 23rd. I met that claim the next week on public grounds, upon the evidence before me, truly not dreaming that the supposed Bessemer invention was a mere pirated imitation from the prior patentee, under the extraordinary circumstances which have since come to light." What little truth there is in this statement about public grounds and the evidence before him, may be gathered from the fact that the *Mech. Mag.* for April 26th contains an abstract of M. Martien's claims. Thus we see that four months before he wrote, and before anything was heard of the invention of "transcendent-merit" notoriety, Martien's claims were well known to the public, M. Mushet excepted. Had he referred to the *Mech Mag.* for information, he might have avoided the quagmire of misrepresentation and interpolation into which ophthalmia and indolence have led him. While arrogating to himself a knowledge of what is doing in the metallurgical world, it slips out that it was several months after the publication of the patent, and not until the most bombastic accounts were disseminated, did he perceive any merit in the invention. For these few months he was doubtless afflicted with ophthalmia, or perchance fell asleep through the summer; but, when thoroughly woke up by the huzzas of the crowd of flatterers collected around the "gigantic cupel," his vision was suddenly restored, and he saw such incomparable merits as only a very gifted individual could see.

The transcendent merits of the process have not been realized; in fact, just now they appear very far from realization. Mr. Mushet, in recent letters, wishes it to be understood that his highly-wrought encomiums on the Bessemeric process were penned in full reliance on the correctness of the statements emanating from Baxter-house, and in the belief that the inventor had underrated the importance of his invention. He now condescends to inform us—in not very clear language, it must be admitted—that the patentee's statements are not borne out by subsequent results—that those statements threw him off his guard; in short, he has been greatly deceived in the matter, and has just cause of complaint against the patentee. Instead of improving his position, these admissions cover him with ridicule. What can your readers think of the individual who, in one *and the* same discussion, speaks of his very presence at an experiment being construed into encouragement, and an acknowledgment of the utility of an invention, and then openly admits that, so far from being at any trouble to inquire into the matter under discussion, he merely echoed the sentiments of the patentee! He volunteers to give his opinion of an invention, and then, finding manufacturers treating his statements with derision, he shields himself under the plea that he was acting merely as the mouth-piece of Mr. Bessemer! Truly there are few who will envy him his office, even with the recent change of masters.

As a last expedient to get out of the mire, Mr. Mushet drags violently at Mr. Carpmael, patent agents, and patent law, and asserts that they are the cause of his unpleasant position. Neither of them seem disposed to lend him a helping hand, and ophthalmia of long standing effectually prevents his seeing the only way of honourably extricating himself.

I am, Sir, yours, &c.,

WM. TRURAN.

To the Editor of the Mechanics' Magazine.

SIR,—There is only in Mr. Green's childish letter, in your last number, one point which requires notice. He perseveres in his discreditable practice of misquotation. I gave in my last reply the exact words in my letter to the *Mining Journal* of the 20th of September, which *The Builder* misquoted. I will now give the exact words of the 30th of August, which Mr. Green misquotes:—"I have for some months been very kindly invited to witness Mr. Martien's *operations* at the Ebbw Vale Works, and everything was very nicely arranged for me, had not other engagements hindered my visit. I should, of course, have liked to see how it was managed at such important iron works, but I must candidly confess I did not entirely regret being detained away. I had no wish to be placed in a position to be compelled to discourage, or to sanction by my presence, operations in which I had no faith, and could not render any service—*the more as I had expressed my opinions pretty explicitly on the whole subject* in the *Mechanics' Magazine* and in the *Journal of the Society of Arts*." Now, the context which precedes this can leave no informed man in any doubt what subject I referred to; but what does Mr. Green do? He substitutes in the above passage the word *invention* for *operations*. If we can give Mr. Green credit for not knowing his letters, this *may* have been *unintentionally* done; but if done wilfully, it is morally as bad as altering a

figure or signing a false name in a cheque, an offence for which Mr. Green, a few years since, would have been hanged. But even this forgery will not bear out the subsequent assertion, that the "precise nature of Martien's claims (that is, his invention) are specified;" the precise nature of the *operations* I was writing on is indicated in the last words following, "service," which Mr. Green *has suppressed*. Should any of your readers care to trouble themselves further on the veracity of such a character as Mr. Green, and his impudent attempt to deceive them, the letters I refer to, written immediately after Professor Wilson, in March, 1855, read a paper at the Society of Arts, on the Iron Industry of America, will satisfy them whether or not I wrote on the Renton process; and if any passage can be discovered in those letters indicating my knowledge of Martien's process for purifying iron without labour and without fuel, I think I may set up a prior claim to both inventors, at least so far as publication.

The fine stories about the "goodly company" and the "rail" are unfortunate, as proceeding from a man who has now been proved, in two letters, to write always the exact reverse of the truth. Indeed, Mr. Bessemer may well cry, "Save me from my friends!" I can remember no instance in which a case has been so torn to pieces as his has been by damaging advocates.

I regret Mr. Green should suffer an anxiety to visit me; but I must beg to decline the obliging offer of his personal acquaintance.

However, when he is decked up as a regular Guy, in spectacles, to look at the weathercock, of course the weathercock will take a look at him. Fortunately for such candidates, the pillory is abolished.

I am, Sir, yours, &c.,

DAVID MUSHET.

November 10, 1856.

[Further letters in continuation of this discussion, must be brief, or they will not be inserted.]

THE PATENT ELEVATOR.

To the Editor of the Mechanics' Magazine.

SIR,—In the *London Illustrated News*, the *Builder*, and other newspapers, I find engravings and details of a "newly invented elevator," which is said to be *patented* as the joint invention of Messrs. Stocqueler and Saunders! Such an elevator is by no means new. In the year 1826 or 1827, I well remember having seen, in London, a pretty little model of a fire-escape, on the very same principle as this "newly invented" one. This geometrical fire-escape, as it was termed by its inventor, Dr. Henderson, of Dunfermline, in Scotland (now of St. Helen's, Lancashire), was the original, on which many fire-escapes of that period were based — one of which, Mr. Editor, you will see in the 11th volume of the *Mechanics' Magazine*, pages 65—68; there you will find an engraving of this newly invented elevator, alike in all its details. I then beg to ask you, how a patent has been allowed to be taken out for a thing which has been *patent* to all the world for thirty years? You will oblige me by inserting this note, and at the same time giving your opinion on the worth and validity of this "new patent" fire-escape, for it is nothing more or less than the invention of Dr. Henderson, and is thirty years old.

I am, Sir, yours, &c.,

JAMES TELFORD.

Liverpool, Oct. 4, 1856.

[Unquestionably the employment of lazy-tong levers in the construction of fire-escapes and other elevators is not new; but in the specification of their patent, Messrs. Stocqueler and Saunders say their invention "consists chiefly in using *three sets* of levers, on the 'lazy-tong' principle, so fastened," &c.; and they do not claim any other arrangement, although the remarks of some of our contemporaries contain no reference whatever to the circumstance. The mere prior existence of machines with two sets of such levers only would not invalidate their claim; but if it can be shown that three sets have before been used publicly for the same purpose, or that the use of lazy-tong levers generally for the purpose has been patented previously, their patent is worthless.—ED. M. M.]

FLYING BY MAN.

To the Editor of the Mechanics' Magazine.

SIR,—Your worthy correspondent, Dr Lotsky, sometime since gave us a few hints concerning an apparatus which he seems to have in his mind; but as he did not go into detail, or give us the slightest sketch of the invention, I fail to think that his letters on the subject were of much use.

I now propose to describe a method which has struck me, and which I think would be likely to answer.

Four sails (as of a windmill) should be provided, and placed upon a shaft in a vertical position. These sails should be inclined to one another at a certain angle (the same way as in the common flying top), the shaft should be produced and connected with the car, and should be in conection with certain bevel wheels made of a light material. These should be so arranged as easily to be turned by the hand, and to cause the vertical shaft and sails to revolve rapidly. I think the

revolution would be sufficient to cause the whole to ascend, and to continue so to do as long as the motion lasted.

I am, Sir, yours, &c.,
A DUBIOUS READER.

Nov. 10, 1856.

DR. LARDNER'S INVESTIGATION OF THE MOON'S MOTION.

To the Editor of the Mechanics' Magazine.

SIR,—Your correspondent, Mr. Good, feels himself aggrieved by the remarks I made on his previous communications. It is very much to be regretted that the necessity should so often exist of exposing that which seems to give such dire offence to call by its right name. Dr. Lardner's explanation, even as quoted by Mr. Good, resolves itself into the well known principle of composition and resolution of velocities, which is no more the learned Doctor's discovery than it is Mr. Good's, and is certainly in little danger of suffering from the brisk attacks of its present animated opponents. It is a stale trick—(I do not wish to impute to Mr. Good an intentional trick)—to dress up a philosophical fact in the garb of a contradiction and an absurdity, and thus to hold it up to ridicule. And so the resolution of motion at a place on the earth's surface according to the well established principle above referred to, and with all the limitations which that principle involves, gives forsooth, according to Mr. Good and the new light philosophers, motion *towards all the points of the compass at once!* If Mr. Good had mastered this principle, he would have known that towards two directions at right angles to that in which the motion is made, there is no motion whatever; and that their directions separate that half of space *from* which the motion is made from the other half *towards* which the motion is made.

Mr. Good will hardly be hardy enough to question the fact that, in taking a walk, a person does alter his position with regard to *all* places in the neighbourhood; and that therefore he has a *velocity* with regard to these places; or, perhaps, he will in another little discovery, announce how he can take a walk from Pembroke Dock, towards Pembroke, without altering his distance and bearing with regard to St. Ann's Head or Tenby; *from* the one and *towards* the other of which places we, in our ignorance, should suppose him to proceed.

This learned gentleman seems very fond of paradox; and this taste he has found occasion to display in another little discovery which he communicated, with all the pomp and circumstance befitting it, in your *number of* October 25th; where he shows, by irrefragable proof, that, according to Dr. Lardner's principles, the earth's axis revolves in a circle about every meridian.

In his statement of this most alarming fact, he forgets *one little point*—which, indeed, no mathematician would require to be reminded of—namely, that while the motion of every point in the earth round her axis is *absolute*, that of one point and the earth round another is *relative* only, and arises from the circumstances that both these points have not the same absolute motion. Thus, if two points situated one at distance R, and the other at distance r from the earth's axis, have in consequence of the earth's angular rotation (ω) the velocities ω R and ωr; and the latter point consequently relatively to the former has the velocity ω (R$-r$), that is, it apparently describes a circle whose radius is the difference of the radii in question, and this in an *opposite* direction to that of the motion of the first point. The *absolute* velocity of the second point is obtained (in accordance with the principle of composition and resolution of velocities) by adding it with its proper algebraic sign to the absolute velocity of the point (R). Thus the absolute velocity of the second point is ω R $-$ ω (R$-r$) $= \omega r$.

If the second point is in the axis, or $r = o$, the *relative* velocity with regard to point R is $-\omega$ R; and its absolute velocity ω R $-\omega$ R $= o$ as it ought.

I am almost ashamed to insist on these elementary truths; my apology must be found in the possibility of some of your readers being misled by Mr. Good's sophisms, and their being induced to mistake error for truth.

I am, Sir, yours, &c.,
A LOOKER ON.

London, Nov. 3, 1856.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

HORNER, H., and R. BAGLEY. *Improvements in buffers and draw and bearing springs for railway and other purposes.* Dated Mar. 12, 1856. (No. 593.)

This invention consists of a compound helical and conical metallic spring, and is formed by twisting or coiling one end of a round, square, flat, or oval steel into a parallel spiral, returning the other end back inside to a conical or helical form to any distances circumstances may require, which said compound or double spring is placed into a metallic cylindrical case or box in which works freely (after the form of a telescope) a compound or double hollow plunger or ram, the outer and longer coils of the spring filling the whole length of the

box and plunger, the inner and shorter coil of the said spring only occupying part of the space between the end of the inner plunger and bottom of the metal box or case.

SPENCER, G. *Improvements in supporting the rails of railways.* Dated Mar. 12, 1856. (No. 594.)

The object here is to connect and support the rails of railways so that in every part of their length, as well at the bearings as elsewhere, elasticity may be obtained. The patentee uses corrugated plates, with the corrugations placed longitudinally or transversely, either continuously or in blocks at intervals running under or along both sides of the rail to be supported. He then places on these at intervals short bearers or girders of wrought iron, or short transverse bearers of corrugated iron which are to be attached to the top of such side or bottom bearing plates, and to these short bearers the rails are to be secured. These short bearers being elastic will bend when the weight of the rolling load comes on them, and when the load passes on to the other parts of rails between these elastic bearings the rails will also bend, and thus will be elastic in every part of their length.

PONTIFEX, E. A. *Improvements in the manufacture of tartaric and citric acids and tartrate of potash and soda.* Dated Mar. 12, 1856. (No. 598.)

The patentee first separates or filters the liquors from which tartaric and citric acids and tartrate of potash and soda are obtained from so much of the sulphate of lime, or baryta, &c., as is not in solution, and from impurities by pressure through fabrics, and then evaporates in vacuo nearly to concentration, and then, if necessary, lets the concentrated liquors deposit any sulphate of lime, or baryta, &c., that may have been previously held in solution by the weak acid liquor, and afterwards completes the concentration to the point of crystallisation. After the crystals have been formed, he again melts, and after having deodorised the liquor in the usual way, evaporates in vacuo, if required, until the crystals are sufficiently pure. The meltings in the various crystallisations are conducted, by preference, in the vacuum pan. The vacuum pan is composed of a cast iron or other strong metallic vessel lined with lead, the air being exhausted between the vessel and the lining. Certain overflow vessels, external condensers, and valves are also employed.

HAYES, W. B. *Certain improvements in looms for weaving.* Dated Mar. 12, 1856. (No. 602.)

These improvements consist—1. In applying a break to the fly wheel of the loom. 2. In applying the same break to the fly wheel with moderate force. 3. In causing the picking tappet, in looms furnished with the under pick, to act upon the picking stick through the intervention of a straight lever of the first order. 4. In adding to each of the treadles of the hedding apparatus in plain looms a curved arm, so that the treadle is lifted by the action of the tappet when the healds are being raised. 5. In attaching the ropes or chains by which the weighted levers of the warp beams are suspended to the arms of a vibrating back rest, such ropes or chains passing also round the necks of the warp beam, so that the adjustable weights which govern the letting off of the warp serve also to effect the recoil of the vibrating back rest when the shed is closed. 6. In furnishing the stop-rod with a blade spring or elastic arm projecting backwards, which is depressed by a pin upon the crank arm in all positions of the latter, except when most elevated by the approach of the crank to the top centre, so that the tendency of the vertical arm of the stop-rod towards the shuttle box is neutralised in all other positions of the crank arm.

RYDER, J. N. *An improvement in the slide valves of steam engines.* Dated Mar. 12, 1856. (No. 603.)

This invention is intended to save steam by reducing the quantity contained in the ports or passages at each stroke. It consists in making the faces of the slide valves concave, and the outside surfaces of the cylinder through which the ports or passages are made, and in which the slide valves move convex, to correspond with the valves.

MURRAY, G. *An improvement in the construction and manufacture of wheels for locomotive engines, waggons, and other carriages to be used on railways.* Dated Mar. 12, 1856. (No. 604.)

This invention was described and illustrated at page 394, of No. 1733.

DUCKWORTH, C., and T. MARSDEN. *The manufacture of a new or improved woven fabric.* Dated Mar. 13, 1856. (No. 606).

This invention consists in producing in an ordinary loom, or by any suitable mechanism, fabrics having flushed or floated surfaces on both sides similar to each other, which fabric may afterwards be printed so as to resemble "zebras."

STURGE, J. and A. *Improvements in rotary fluid meters.* Dated Mar. 13, 1856. (No. 608.)

This invention comprises the use of a blade (or blades) forming a part of a screw, the axis of which is placed perpendicularly in a chamber through which a column of liquid is made to flow; also the use of perforated plates or gratings, causing the fluid to flow in perpendicular lines.

REES, G. *An improved method of producing figured or ornamental surfaces on glass.* Dated Mar. 13, 1856. (No. 609.)

The patentee takes a sheet of finished glass, and having rendered it plastic by heat, presses it between a pair of metal dies, male and female, engraved with the design or pattern which is to be given to the glass, and anneals it.

DIXON, I. *An improved propeller for steam ships and other vessels.* Dated Mar. 13, 1856. (No. 610.)

This invention was described and illustrated at page 370 of No. 1732.

CHATEAUNEUF, G. DE. *A hydro-pneumometric gas meter.* Dated Mar. 13, 1856. (No. 611.)

This invention consists of an improved construction of gas meter for maintaining the water always at the same level, and regulating at the same time the current of gas passing through it, the latter being applicable to dry meters.

PORTER, T. *Improvements in looms for weaving carpets, coach-lace, velvets, and other piled fabrics.* (A communication.) Dated Mar. 13, 1856. (No. 612.)

This invention relates to a novel arrangement of mechanism for withdrawing pile wires from the fabric into which they have been woven, to form loops on the face thereof, and for inserting them again in the open shed.

MURDOCH, J. *An improved mode of manufacturing cut velvets and other similar fabrics.* (A communication.) Dated Mar. 13, 1856. (No. 613.)

This invention consists in a method of guiding the blade or knife which cuts the threads of wool to form the velvet surface, and that in the direction of the warp. It is based upon the introduction among the threads of the warp of thin cords, which are intended when the fabric is woven to serve as a guide or conductor to the fabric or the knife, according as the one or the other is set in motion.

PIMONT, P. *A certain process for restoring metallic spoiled pens.* Dated Mar. 14, 1856. (No. 615.)

Spoiled metallic pens are raised to a red heat, or to any sufficient temperature. The pens are then allowed to cool, and afterwards cleansed from dirt or smoke. This restoring operation, if not sufficient, is repeated.

GARDISSAL, C. D. *An improvement in capstans.* (A communication.) Dated Mar. 14, 1856. (No. 616.)

This invention consists in the arrangement of a stationary drum head in combination with a stationary base and spindle, and a revolving barrel, which is moved by gearing within the drum-head and barrel.

GARDISSAL, C. D. *An improvement in ships' windlasses.* (A communication.) Dated Mar. 14, 1856. (No. 617.)

This improvement consists in an arrangement of a shaft with double gearing and clutch couplings in relation to two barrels of a windlass and their gearing, whereby one or both barrels may be moved with a quick or slow motion, or the one with a quick and the other with a slow motion.

MARCUS, P. *An apparatus for working the damper in steam engine furnaces.* (A communication.) Dated Mar. 14, 1856. (No. 618.)

This invention was described and illustrated at page 564 of No. 1714.

YATES, W. *An improvement in furnaces.* Dated Mar. 14, 1856. (No. 619.)

This invention consists in a feed apparatus fitted to the front of a furnace for causing the fuel to present itself to the air admitted in the manner hereafter explained, and render combustion as perfect as may be. The patentee mounts upon an axis a hand lever, and connects to the axis a lever or plate which extends across the opening for the door, and terminates at bottom in a grating through which the air enters. Over the axis of the lever he fits a fuel hopper. The door consists of a sliding plate made to cover more or less of the grating by being raised or lowered as required. The fuel falls from a hopper down on a plate inside the grating, and after having become coked, the lever is drawn down, whereby the grating is tilted inwards, and drives the coked fuel into the furnace, and on being restored to its position by releasing the lever, a fresh supply falls from the hopper.

NEWTON, W. E. *Improved machinery for separating gold and other metals from their ores.* (A communication.) Dated Mar. 14, 1856. (No. 621.)

This invention consists—1. In the use of a metal basin, which is supported at its centre by a ball and socket joint, and by the bed upon which it is adjusted at the depressed point of contact between the lower surface of the basin and bed, caused by the rocking and gyrating of the basin by the revolution of the crusher ball contained therein. 2. In the use of an arm for depressing the side of the basin immediately in front of the crushing ball, in combination with a second or supplemental ball in the basin, arranged in such a way as to follow the crusher ball always down the inclined plane of the basin. 3. In the construction and use of an amalgamating mill, through the cone of which the wash of the crusher basin is discharged to be ground, and agitated in contact with a volume of quicksilver confined by a barrel surrounding the mill stones.

COATES, C. *Improvements in apparatus for communicating motion to machinery used in bleaching, printing, dyeing, and finishing fabrics.* Dated Mar. 15, 1856. (No. 622.)

This invention consists in the application of circumferential friction pulleys for transmitting motion from the driving shaft to the machine to be driven.

RICHARD, L. J. *Improvements in sugar manufacture.* Dated Mar. 15, 1856. (No. 623.)

This invention consists in the application of the carbonates of soda, potash, or any chemical agent acting in a similar manner as these carbonates in respect to saccharine matters, to the defecation, purification, clarifying or refining of saccharine juices, syrups, raw or other sugars.

WRIGHT, E. T. *An improvement or improvements in the manufacture of steam engine boilers, iron ships, and boats, and such other vessels and things as are or may be made by rivetting together metal plates.* Dated Mar. 15, 1856. (No. 625.)

This invention consists in so arranging the riveted joints of cylindrical boilers, &c., that they shall not run parallel to the axis of the boiler, but in a line oblique thereto. (See *Mech. Mag.* page 417, No. 1734.)

WINFIELD, R. W., J. SIMMS, and T. LLOYD. *Improvements in the construction and ornamentation of metallic bedsteads and other articles of metallic furniture.* Dated Mar. 15, 1856. (No. 626.)

Claims—1. A method of constructing the corner blocks of metallic furniture. 2. Coating taper rods or pillars, or partially taper and partially cylindrical rods or pillars, with brass or other metal or alloy, as described. 3. Ornamenting metallic furniture, by encasing the same in ornaments, the general figure of which is tubular, the said tubular ornaments fitting closely upon the rod or pillar to which they are applied.

RICE, J. and W. *Improvements in breech-loading repeating guns and rifles.* Dated Mar. 15, 1856. (No. 627.)

This invention consists in fitting to the fire-arm a metal cylinder, having a series of chambers cut or bored therein. Upon the periphery of the cylinder a spiral groove is cut, a quarter of a revolution of which will bring one of the charge chambers in a line with the bore of the barrel. The cylinder fits into a socket at the breech of the barrel. Studs serve to guide the cylinder when it is rotated. At the lower part of the socket is a bolt acted upon by a spring each time the cylinder is turned, which bolt prevents the cylinder from shifting until the bolt is withdrawn, by pressing a nut connected with it, and fitted just above the trigger, or by the pressure of the cylinder on the bolt as it is rotated. The outer end of the cylinder is fitted with a cross handle by which it is turned round to bring the charges successively opposite to the bore of the barrel.

DUMAS, J. *An improved description of tile.* (A communication.) Dated Mar. 15, 1856. (No. 628.)

This invention consists in constructing a series of uniform tiles, in such a manner that they may be fitted together in one direction by mortice or socket joints, and in the other or transverse direction by raised ledges on their respective edges abutting closely together.

BESSEMER, H. *Improvements in the manufacture of iron and steel.* Dated Mar. 15, 1856. (No. 630.)

This invention relates—1. To the peculiar modes by which the decarbonization, or partial decarbonization and refinement of iron is effected by means of currents or jets of atmospheric air or steam (alone or mixed), and which is made to impinge upon the surface, or pass through, or in contact with, the metal while in a fluid state. 2. To assisting the decarbonization and refinement of iron by the use of oxides of iron, and in the use of carbonaceous matters during such process; and, 3. To the manner in which the metal so treated is formed into ingots or masses suitable for being afterwards made into bars, plates, or rods, by the process of hammering or rolling. In carrying the first part of the invention into operation, in some cases the patentee forces atmospheric air or steam, or a mixture of air and steam, below the surface of the melted metal, which collects in the hearths of blast and cupola furnaces used for smelting and founding iron, and to allow the air or steam to bubble up through the metal, and then mingle with the blast used for keeping up the combustion of the fuel above. For the process of decarbonizing and refinement of the iron, without the use of additional fuel for that purpose, he constructs a box or chamber of brick, fire-stone, or iron, lined with loam, or other slow conductor of heat. The chamber should be closed, except at one end, where there is a raised outlet for the escape of the air or steam, and aëriform matters produced. At the opposite end the cover rises, so as to form a space for the admission of the air or steam above the surface of the metal. The metal, in a fluid state, is run into the box or chamber, which may be previously heated, so as to fill it up to the cover, and at least a few inches up the raised parts; the air or steam is then forced into the space above the surface of the metal, which will be displaced therefrom, and allow the air or steam to find its way along the cover of the chamber, and pass up through the metal in

the raised outlet, where it will escape, and where the slag formed in the process will also be carried. The cover may be flat or corrugated, or it may have projecting ribs, with or without perforations, to obstruct the too easy progress of the air. The third part of the invention consists in forming masses of refined iron or steel of a suitable form or configuration for hammering or rolling, or for other purposes, by forming the vessel or chamber in which the iron is refined, or partially refined, by air or steam, of such form and dimensions as will admit of the metal being retained therein, after the process of refinement, until it is sufficiently solidified to be removed therefrom, the decarbonizing vessel serving as the mould for giving the desired form to the mass. When, however, the metal is refined in vessels unsuited, by their form, for the formation of the ingot or article desired, the patentee constructs an ingot mould having a runner or gate communicating with the bottom of the mould, and extending upwards to the top of it, so that the mould is filled from its lower end, the metal rising upwards until it is filled. When the mould is of iron, the runner should be lined with loam to prevent the metal from becoming solidified therein before the ingot is completed, but he sometimes forms such ingot-moulds of porous fire-clay, fire-stone, or other slow conductor of heat, so that the metal will retain its fluidity sufficiently long to allow much of the gaseous matters to escape, which would otherwise render the casting cellular.

RANDOLPH, C., and J. ELDER. *Improvements in marine engines.* Dated Mar. 15, 1856. (No. 631.)

In carrying out this invention, as regards the arrangement of the cylinders in relation to the cranks, when the vessel contains a pair of such engines, one of the pistons of each engine is connected with the same crank, that is to say, the pistons of the two smaller cylinders to a crank, and those of the two larger cylinders to another crank or otherwise, the piston of the small cylinder of one engine, and that of the larger cylinder of the other engine to the same crank, and these arrangements are effected commonly by direct connections with the cranks; but when the vessel contains only a single engine, the two pistons are connected to opposite ends of a beam-lever, which communicates at one end with the single crank by any of the ordinary methods of connection, and this arrangement is also applicable when the vessel contains more than one engine. The distinguishing peculiarity of the steam valves *is*, that the first in order, namely, that to *the small* cylinder, is merely an induction valve, and so adjustable as to have a greater or less amount cut off, and thereby to permit the supply of steam to be regulated at pleasure, and that the second or intermediate valve serves the several purposes of eduction valves to the first cylinder induction valve to the second or larger cylinder, and eduction valve from the cylinder to the condenser. Another improvement consists in arranging the gearing for working the valves of steam engines, in such manner that the engines can be made to go forwards or backwards, or be brought to rest by the action of a single handle.

PEGG, J. *Improved steering apparatus.* Dated Mar. 15, 1856. (No. 632.)

This invention was described and illustrated at page 395 of No. 1733.

MITCHELL, J. *Improvements in apparatus for washing and amalgamating ores and other matters.* Dated Mar. 17, 1856. (No. 633.)

This invention consists of apparatus which causes the pulverised ores and matters to be washed or amalgamated to be moved together with the fluid in troughs by screws. These troughs are divided by a partition of such a height that the current of fluid and matters under process may pass from trough to trough.

HILLS, G. *Improvements in treating fatty and oily substances, so as to obtain stearine and oleine in separate states.* Dated Mar. 17, 1856. (No. 634.)

Claims.—1. For the purpose of separating the oleine from the stearine of fatty and oily matters, the employment of liquid muriatic, or liquid nitric acid, in conjunction with dry sulphate of lime, or dry chloride of calcium, or other substance capable of absorbing water from either of the above-named acids. 2. For the above-named purpose, the employment of streams of muriatic acid gas, or nitric acid gas, whether in conjunction or not with dry sulphate of lime, or other equivalent material.

NORMAND, C. B. *Improvements in the treatment and employment of steam in steam-engines, and in apparatus for effecting the condensation of steam.* Dated Mar. 17, 1856. (No. 635.)

Claims—1. A method described of separating from steam the particles of water and of grease contained therein, and that whether the steam be acted upon immediately upon it issuing from the boiler, or after it has performed a part of its work. 2. The introduction of steam at boiler pressure into the pistons of steam engines, for heating the pistons, and improving the economy of the engine. 3. Super-heating partially exhausted steam, or steam at a low pressure when deprived of the water it contained, by mixing therewith ordinary high pressure steam. 4. As to surface condensers, the

general arrangement of the parts as described, also the mode of connecting the tubes to the tube plate, the division of the condenser into two parts (operating at different temperatures), for the purpose of providing for the loss of fresh water and heating the feed, and also effecting a division in the exhaust of the engine, whether in conjunction with surface or common condensation.

PALMER, T. *Pumps with a new or improved box or valve.* Dated Mar. 17, 1856. (No. 637.)

The patentee constructs pumps by attaching to the main rod thereof, brackets and annuli holding rings, or layers of leather, or other suitable material (that is material resembling leather as regards pliability, toughness, and subsistence in water). On this centre spindle the valve works.

THOMSON, R. *Improvements in weaving.* Dated Mar. 17, 1856. (No. 638.)

Claims.—1. The mode of arranging and constructing the actuating details of treddles in looms, wherein the treddles are moved by jointed hooks which can be put into and out of gear with the treddles by suitable mechanism, as described. 2. The mode of putting the actuating details of treddles into or out of gear with the treddles, by means of a barrel or its equivalent fitted with pins capable of being disposed according to various patterns, and arranged to act on jointed portions of such details as described, together with various described contrivances for actuating such barrel or its equivalent. 3. The mode of keeping a shed open during two or more picks, for producing a "cord" effect, by means of hooks actuated by a pattern barrel, so as to hold down the treddle as described. 4. The mode of working the treddles of looms by a jacquard barrel, contrived so that by shifting it longitudinally it will act upon the treddle levers, according to various patterns as described.

GRAHAM, W. *Improvements in marine compasses, and in adjusting the same on board ship.* Dated Mar. 17, 1856. (No. 639.)

This invention consists—1. In correcting local attraction. 2. In adjusting the compasses. The first part is a modification of a former patent, dated Nov. 30, 1854, obtained by Mr. Sands as a communication from the present patentee, and consists in laying a number of corrective adjustable magnets radially round the needle platform.

FONTAINEMOREAU, P. A. L. DE. *Improvements in churns.* (A communication.) Dated Mar. 18, 1856. (No. 640.)

This invention consists—1. In substituting sheet or tinned iron for wood and zinc in the construction of churns. 2. In certain arrangements for employing the influence of the atmosphere so as to obtain butter more expeditiously and of a better quality.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

GREENE, H. *Improvements in locomotive engines and carriages running on railways.* (A communication.) Dated Mar. 11, 1856. (No. 589.)

The principal part of this invention consists in arranging the cylinders and other working parts of the engine upon one frame, and upon another frame, distinct from the former, but coupled thereto, the boiler for generating steam to work the engines, connection being made between the cylinders and the boiler by suitable pipes and universal joints, the exhaust steam from the cylinders being conveyed back to the chimney of the boiler to form the blast by similar pipes and joints.

STANLEY, J. M., G. BELLAMY, and W. BOOTH. *Improvements in the manufacture of rolls for rolling steel, copper, lead, or other malleable material.* Dated Mar. 12, 1856. (No. 595.)

This invention relates to a mode of casting such rolls. The inventors purpose to cast the axle separately, of tough metal, and when cold to cast upon it the perimeter or shell of a harder metal of finer texture; the cold axle will effect the chilling or hardening of the perimeter, so that no chilling cylinder will be required. The whole may be cast in open sand, thus rendering the manufacture cheap. To prevent the fracture of the perimeter from contraction during the cooling, the axle is cast smaller in diameter at the middle than at the extremities.

PALMER, C. R. N. *A new telegraph and improved telegraph or signal apparatus, parts of the invention, apparatus, or manufacture being applicable to other purposes.* Dated Mar. 12, 1856. (No. 596.)

The inventor proposes to work a bell or other signals from any part of a steam or sailing ship, railway train, coal mine, pit, or building, to any distant part, by means of exhausting cylinders and pistons, or air vessels, causing a partial vacuum in distant signal cylinders.

VIGARS, J. *Improvements in machinery for lifting in mines, also applicable to other purposes.* Dated Mar. 12, 1856. (No. 597.)

This invention relates to a method of hauling up and letting down kibbles or buckets from and into the shaft of a mine, by machinery connected with the pump rods of the pumping engine; but it is applicable to other purposes, where a reciprocating motion is required to be converted into a continuous rotary motion, whose direction must be instantly reversible at will. The machinery is composed of a

combination of racks, ratchets, pinions, &c.

CHALANGE, L. M. *Certain improvements in corn-mills.* Dated Mar. 12, 1856. (No. 599.)

This invention consists in casing in the mill-stones in such manner that air enters only through the eye of the upper stone, and in connecting therewith a fan or ventilator whereby the air is drawn through and out at the periphery.

CORBITT, W., and G. SHAW. *Improvements in buffer-bearings and draw-springs for railway and other carriages.* Dated Mar. 12, 1856. (No. 600.)

This invention consists in the use of metallic springs of different strengths or thickness, to be varied according to the force to be resisted or weight borne. Supposing that metallic elliptic springs are employed, the inventors place them in a box or case singly, and not on each other, as in the ordinary springs; and in the case are slides or grooves for the plunger to work in. At the centre of the springs are placed India-rubber rings, so that when in action, and driven home, the India-rubber will prevent them from coming into contact with each other, and will present an additional resisting force by its elasticity, and prevent them being broken by concussion.

EDWARDS, F. H. *Improvements in railway brakes.* Dated Mar. 12, 1856. (No. 601.)

This invention consists in working brakes by means of steam cylinders, &c., attached to each carriage.

TAYLOR, T. W. *An improvement in flying or roving frames.* Dated Mar. 12, 1856. (No. 605.)

The inventor, instead of the present long spindle, and the steps and rail in which it runs, attaches a short dead spindle in what was its upper bearing in the bobbin traverse beam, and causes the bobbin to revolve around this spindle. He makes the hub of the flyer much longer than before, and hollow, and makes two journals in this hub, one at the top, the other at the bottom of the hub, and just over the apex or top of the flyer arms. Between these two journals he employs a suitable gear. These flyers and gears are placed in a proper and moveable frame over the dead spindles and bobbins, the centre of each bobbin pointing towards, and being directly underneath the hollow or hole in the hub of the flyer. The roving is passed through this hole, and through a tube in one arm of the flyer, and is thus delivered to the bobbin.

BERARD, P. H. G. *Improvements in the manufacture of waterproof fabrics, which improvements may also be applied for rendering other substances waterproof.* Dated Mar. 13, 1856. (No. 607.)

These improvements consist in the employment of collodion in rendering fabrics and other substances waterproof.

CLAY, W. *Improvements in the manufacture of the points or switches and crossings of railways.* Dated Mar. 14, 1856. (No. 620.)

This invention relates to means of producing tapering bars or points, and this may be done in two ways. The inventor either rolls down iron to a taper form, in the manner and by machinery for which he has already obtained letters patent, or he takes iron bars of a parallel or nearly parallel form, and by means of circular saws or other suitable contrivance, cuts off one of the angles of the bars, so as to bring it to a point.

HAWKINS, J. B. *Improvements in couches or sofas, parts of which are applicable to other like furniture.* Dated Mar. 15, 1856. (No. 624.)

These improvements refer to making couches reversible, so as to have right or left-hand scroll ends, securing the several parts with screws, or with studs and slot holes, and in the mode of fixing and tightening the bottoms of web or other suitable material, which bottoms are also applicable to other articles of furniture.

OLDHAM, W. *Improvements in the manufacture of cement.* Dated Mar. 15, 1856. (No. 629.)

These improvements consist in grinding white or blue lias lime to a powder, either separately or with a suitable admixture of clays. These materials are then rendered plastic, formed into suitable shapes for burning or calcining, and reduced to powder by grinding to a state suitable for cement, when it is fit for use. By this means the lias lime is never slacked until it is used in the state of cement, when it will set better and more readily under water.

AMOS, J. *An improved flour dressing machine.* Dated Mar. 17, 1856. (No. 636.)

The cylinder of this flour dressing machine is of a conical form, and placed in an upright position, with the smaller end of the cone upwards, the spindle of the brushes being raised and lowered by means of set screws or otherwise.

PRADES, P. DE. *Improvements in wheel-barrows.* Dated Mar. 18, 1856. (No. 641.)

This invention consists in constructing wheel-barrows so that they may be liberated of their contents without throwing the entire barrow over on one side. The legs and handles are firmly secured to a horizontal cross-bar, from the centre of which, at right angles, proceeds another bar, forked at its further end to receive the wheel or axle, or a wheel may be placed on each side. On the centre bar, between the wheel and front cross-bar, are two raised bearings to receive

corresponding axles attached to the bottom of the wheel-barrow body, which can thus be made independent of and adjustable to the framework. The inventor affixes a sliding bar on one side of each handle, arranged so that the workman can withdraw the right or left hand bar as required, thereby unbolting and tilting the barrow body.

PETTITT, E. *Improvements in machinery for preparing cotton and other fibrous substances.* Dated Mar. 18, 1856. (No. 644.)

The inventor employs a trunk or hopper into which the fibrous substance is fed by a roller in the usual way, and compressed by a piston, and he places at the bottom or end of such trunk a fluted or toothed roller, working against a curved surface, which regulates the exit of the fibrous substance and the quantity fed to the cards. The material is compressed by the plunger, and carried out by the fluted roller, which is driven slower than the feeding roller. The fibrous substance is thus fed over or past the edge of the plate where it is seized by the licker-in roller of a carding or preparing machine.

BARBER, H. *Improvements in the manufacture of hosiery goods.* Dated Mar. 18, 1856. (No. 647.)

This invention relates—1. To a mode of facilitating the placing of the thread which forms the "setting on" upon the needles of knitting machinery. Instead of lapping the thread round the needles, the inventor proposes to place it upon a bar suitably provided with pins or wire to receive the thread, and to transfer the "setting on" thence to the needles. 2. To a more ready mode of placing a ribbed or other top on a circular frame. 3. To a mode of obtaining a better mixture of coloured threads than is now obtained in knitting frames, by giving a rotary motion to the bobbins or spools which contain the threads at the time of manufacturing the fabric, and thereby twisting the threads together.

PROVISIONAL PROTECTIONS.

Dated July 15, 1856.

1664. Arthur Neild, of Manchester, spinner and manufacturer. Improvements in Jacquard and other pattern looms. A communication.

Dated August 1, 1856.

1822. John Avery, of Essex-street, Strand. Improvements in bonnets and other coverings for the head. A communication.

Dated August 6, 1856.

1858. James Braby, of the Borough Haymarket, Newington-causeway, wheelwright. Improvements in sawing machinery.

Dated September 24, 1856.

2234. Antoine Jean Baptiste Lespinasse, of Toulouse, France, engineer. Improvements in the means of obtaining motive power.

Dated September 25, 1856.

2246. Henry Joseph Marie Edouard Silvy and Amedée Anne Henry Plagniol, mechanicians, of Paris. Improvements in harness.

Dated October 15, 1856.

2408. Edward Hallen, of Cornwall-road, Lambeth, civil engineer. Improvements in the construction of chairs, sofas, bedsteads, and similar articles of furniture to sit or recline upon.

Dated October 21, 1856.

2464. Charles Briqueler fils, of Dunkerque, France. The purification, clarification, and discolouration of the cotton seed oil.

2466. John Cowdery Martin, of Fern Cottage, Charlewood-road, Putney, naval architect. An improvement in glazing paper.

2468. Peter Armand Lecomte de Fontainemoreau, of Rue de l'Echiquier, Paris. An improved knitting loom. A communication.

2470. William Smith, of Salisbury-street, Adelphi, civil engineer. Improvements in water level and pressure indicators and lubricators. A communication.

2472. Robert Davison Atkinson, of Kingston-upon-Hull. Improvements in preparing and coating metallic surfaces. A communication.

2474. George Thomson, of Westbourne-green, Harrow-road, Middlesex, machinist. Improvemets in machinery for cutting or rending wood for laths and other uses.

2478. George Webster and James Webster, both of Fountain-yard, Bridge-end-South, Leeds, engineers. Improvements in the means of opening and closing the slide valves of engines worked by steam or other power.

Dated October 22, 1856.

2480. Godfrey Ermen, of Manchester, cotton spinner and manufacturer. Certain improvements in machinery or apparatus for the finishing and treatment of yarns or threads.

2481. Frederick Walton, of Haughton Dale Mills, near Denton, Lancaster, card manufacturer. Certain improvements in the manufacture of brushes.

2482. George Chappell Potts, of New Oxford-street, cooper. The application of certain materials to the cleaning of casks.

Dated October 23, 1856.

2483. Charles Weightman Harrison, of Woolwich, civil engineer. Improvements in the insulation and protection of electric conductors.

2484. Thomas Gray, of the Ratcliff Works, Rose-lane, Stepney, ink manufacturer. An improved drying apparatus.

2485. John Francis Porter, of Park-street, Westminster, civil engineer. Improvements in the manufacture of bricks and other articles of clay and brick-earth, or of the like materials.

2487. John Christian Bremer, of Fenchurch-street, London. Improvements in propellers.

2488. John Macdonald, of Henry-street, Upper Kennington-lane, Vauxhall, machinist. Improvements in regulating the supply of oil or other liquids, applicable to lamps, gas meters, and other useful purposes.

2489. Nehemiah Brough, of Birmingham, machinist. Improvements in dress fastenings.

2490. Albert Demerit Bishop, of Woolwich, engineer. Improved apparatus for facilitating the finding and raising of vessels and submerged articles.

2491. Theophilus Horrex, of South-square, Gray's-inn, gentleman. Improvements in fastening

buttons and other similar articles on to garments and other things.

2492. John Walley, of Derby, boiler maker. Improvements in the means of preventing explosions of steam boilers.

2493. John Dearman Dunnicliff, of Hyson Green, Nottingham, lace manufacturer, and Walter Dexter, of the same place, mechanic. Improvements in warp machinery.

2494. Leonard Alexander Desachy, of Great Marlborough-street. Improvements in producing architectural mouldings, ornaments, and other works of art formed with surfaces of plaster or cement.

2495. Edwin Allan Athawes, of Blackfriars-road, Surrey. An improvement in the construction of forks for forking land.

Dated October 24, 1856.

2496. James Eglinton Anderson Gwynne, of Essex Wharf, Essex-street, Strand, engineer. Improvements in the manufacture of carbon or charcoal powder for various useful purposes.

2497. Isaac Bailey, book-keeper, of Bradford, York. Improvements in machinery for spinning wool, cotton, alpaca, mohair, and other fibrous materials.

2498. George White, of Bromley, Middlesex, brewer. An improvement in the treatment of grain in order to produce starch and spirit therefrom.

2499. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. An improved oil for burning in lamps and an improved burner and chimney. A communication.

2500. William Woodford, of Taunton, Somerset, gentleman. The prevention or cure of smoky chimneys.

2501. Robert Struthers, of Holyhead, Anglesea, engineer. Improvements in machinery or apparatus for transmitting motive power.

2502. William Mills, of Congreve-street, Birmingham, carpenter. Certain improvements in apparatus for cleansing or removing the soot from chimneys.

2503. Howard Ashton Holden, of Bingley Hall Works, Birmingham, railway carriage furniture and lamp manufacturer. Improvements in furniture for railway and other carriages, and which said improvements are also applicable as a means of finishing or ornamenting the iron parts of harness and other articles made of iron to which such mode of finish or ornamenting has not heretofore been applied.

2504. Louis Auguste Mangin, of Rue de l'Echiquier, Paris. A self-acting door-spring.

2505. Samuel Baxter, of the Minories, London, ships' ironmonger. Improvements in chain wheels, or barrels and stoppers to be used for raising and lowering weights by means of chains.

2506. Charles Anciaume, organ maker, of Quay Bourbon, Paris. Improvements in musical organs, both sedentary and portable.

Dated October 25, 1856.

2507. Gustavus Ernst, of Manchester, engraver and printer, and William Lorberg, of the same place, manufacturing chemist. An improved mode or method of raising or producing designs, patterns, or impressions on the surfaces of plates, blocks, or rollers, and transferring or imparting the same to paper, parchment, woven fabrics, leather, or other similar materials.

2509. Charles James Farrington, of Hampstead, Middlesex, carpenter, and William Comber, of the same place, licensed victualler. Improvements in means or apparatus for giving alarm in case of attempted burglaries.

2511. George Henry Bachhoffner, of Upper Montague-street, Middlesex, doctor of physics. *Improvements in glass shades for gas and other artificial lights.*

2513. Henry Forfar Osman, of Essex-street, Strand, gentleman. An improved contrivance for distending the skirts of ladies' dresses and preserving the required form and shape thereof. A communication.

Dated October 29, 1856.

2534. Richard Robinson, of Eccles New-road, Pendlebury, Lancaster, engineer. An improvement or improvements in machinery or apparatus for sizeing, dressing, finishing, and polishing yarns or threads.

2536. Thomas Garnett, of Low Moor, Clitheroe, Lancaster, cotton spinner and manufacturer. Improvements in the manufacture of paste or size for sizeing, stiffening, or otherwise preparing cotton and linen yarns and woven fabrics.

2538. Louis Adolphe Faure, mechanician, of Paris, and of Essex-street, Strand. An improved pump.

2540. Thomas John, of Pesth, Hungary, and now of Paris, mechanician. A new electric telegraph apparatus for writing.

2542. Arthur James Thompson, brush maker of Birmingham. An improved gum pot and brush, and which said pot and brush are also applicable for holding and using liquid glue, paste, or other adhesive materials, as well as varnish, paint, and such like fluids, which are liable to dry up by the action of the air.

2544. Charles de Jongh, of Lautenbach, near Guebwiller, France, manufacturer. An improved method of, and machinery for, combing and preparing silk, flax, and other fibrous substances.

2546. Frederic Whitaker, of Canonbury-road, Lower-road, Islington. Improvements in apparatus for supplying water to steam boilers.

2548. David H. Whittemore, of Worcester, Massachusetts, U. S. A. An improved machine for paring, slicing, and coring fruit or vegetables.

Dated October 30, 1856.

2550. William May, of London, merchant. Improvements in steam engine indicators. A communication.

2552. Henry Holcroft, of Rue de l'Echiquier, Paris. An improved steam engine, specially applicable to agricultural operations.

2554. James Simpson, of Rochdale, Lancaster, manufacturer, and Henry Spencer, of the same place, agent. Improvements in lubricating steam engines.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," November* 11*th*, 1856.)

1528. R. Orrell, J. Cleminson, and W. Barraclough. Improvements in steam boilers, for preventing explosion thereof.

1534. C. Moriarty. Improvements in the construction of tube brushes used in cleaning the tubes of marine, locomotive, and all kinds of multitubular boilers.

1537. F. G. Sanders. Improvements in the manufacture of ornamental floor and other tiles, bricks, slabs, and other similar articles.

1538. A. Wild. Improvements in the manufacture of boots and shoes.

1540. J. A. Longridge. Improvements in the application of mechanical power to ploughing and other field operations of agriculture.

1557. T. E. Marais. Improvements in railway-signals.

1567. J. Brown. Certain improvements in hats and caps.

1573. J. H. Johnson. Improvements in machinery or apparatus for cleaning and carding cotton and other fibrous substances. A communication.

1574. L. Cornides. Improvements in cementing and uniting together plain or ornamental surfaces of glass, or in uniting surfaces of glass to surfaces of metal or other material.

1575. E. Travis and J. L. Casartelli. Certain improvements in steam engines.

1577. J. Adshead. A new application of a known material to be used as a substitute for plastering, painting, papering, whitewashing, and colouring.

1585. R. Millward. An improved instrument which may be used as a screw-key or gauge.

1593. H. Smith. An improvement or improvements in the manufacture of harrows.

1599. J. H. Noone. Improvements in apparatus for retarding and stopping carriages on railways.

1622. T. Jerome. Certain improvements in buttons for ornamenting and fastening dresses, as also in loops for attaching or holding buttons on garments while in use.

1627. R. D. Kay. Improvements in machinery or apparatus for pressing, straining, sifting, or refining colors and thickened mordaunts.

1628. R. T. Eadon. An improvement in the manufacture of band saws and other endless bands or hoops of metal.

1651. J. Avery. An improved plate-holder for photographic and other purposes. A communication.

1664. A. Neild. Improvements in Jacquard and other pattern looms. A communication.

1679. A. F. Gurlt. Improvements in the manufacture of iron and steel.

1696. W. B. Birkby. Improvements in filleting and fixing pointed teeth in the fillets used in the preparation of flax, tow, hemp, and other fibrous substances.

1704. W. S. Clark. Improvements in machinery or apparatus for digging, pressing, and moulding peat. A communication.

1720. R. Richardson and J. E. Billups. Improvements in the permanent way of railways.

1736. J. Imray. Improvements in bending timber.

1748. H. Doubleday. An improvement in the manufacture of starch.

1829. T. Donkin. Improvements in the glazing of paper. A communication.

1830. J. Rhodes. Improvements in machinery or apparatus for reducing turnips and other vegetable substances to a pulpous state.

1850. A. Pfaltz. A new and useful mode or process for making soap from rosin.

1857. W. Hall, E. Wylde, and W. Waite. Improvements in steam engines.

1890. E. Firth. Improvements in finishing mohair cloth.

2132. W. S. Clark. Improvements in hydraulic heaters or furnace. A communication.

2153. J. Knowelden. Improvements in the arrangement of valves and apparatus for preventing steam-boiler explosions.

2168. R. Mushet. Improvemeats in the manufacture of iron.

2169. R. Mushet. Improvements in the smelting of iron ores.

2170. R. Mushet. Improvements in the manufacture of iron.

2199. A. Hustler. Improvements in looms for weaving.

2219. R. Mushet. Improvements in the manufacture of iron and steel.

2220. R. Mushet. Improvements in the manufacture of iron and steel.

2224. T. Wallace. Improvements in the manufacture of wheels, axles, and axle-boxes.

2293. J. Dauglish. An improved method of making bread.

2306. J. Whitehead. Certain improvements in machinery or apparatus for preparing and spinning cotton and other fibrous substances.

2330. M. Farina. An improved tooth-powder. A communication.

2333. J. Gedge. Improvements in the preparation of rocky substances for obtaining mineral manure. A communication.

2351. J. Chiosso. An apparatus for damping and affixing adhesive stamps and labels.

2359. P. Ward. An improved composition for coating the bottoms of ships.

2365. J. A. Longridge and T. Richardson. An improvement in constructing the fire-boxes of locomotive steam boilers.

2384. W. C. Watson. Improvements in sewing-machines.

2389. G. W. Varnell. Improvements in mounting troughs, mangers, and apparatus used for feeding horses and other animals.

2390. G. Scheurmann. Improvements in printing music when type is employed.

2391. L. Ador and E. Abbadie. Improvements in the manufacture of colours from metals, and in the furnaces or apparatus for the same.

2432. G. Morton. Improvements in escapements for chronometers and other time-keepers.

2462. H. Deacon. Improvements in suspending carriage bodies.

2466. J. C. Martin. An improvement in glazing paper.

2471. J. Shaw. Improvements in preparing the food of cattle.

2497. I. Bailey. Improvements in machinery for spinning wool, cotton, alpaca, mohair, and other fibrous materials.

2500. W. Woodford. The prevention or cure of smoky chimneys.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1853.

2547. Peter McGregor.
2567. William Foster.
2570. John Banks Nicklin.
2581. Marino Louis Joseph Christophe Vincent Falconi.
2594. John Henry Johnson.
2613. Richard Dryburgh.
2614. William Steel.
2648. Joseph Fry.
2671. Robert Griffiths.
2694. John Gerald Potter and Robert Mills.
2710. William Mee.
2742. Davidson Nichol.
2757. Joseph Stenson.
2785. John Hewitt.
2841. Lewis Harvey Bates.

LIST OF SEALED PATENTS.

Sealed November 4, 1856.

1230. Samuel Berrisford and Enoch Wilkinson.
1242. John de Cockkenlfeck.
1248. Frederick Peter Dimpfel.
1286. Francis Alton Calvert.
1287. Alfred Watson and Alfred Hamlyn Williams.
1336. William Smith.
1730. Samuel Colman.
1744. William Webster.

1809. William Edward Newton.
1875. William Webster.
1906. John Goddard and George Hulme.
1946. Charles Clark.
1989. James Earl of Caithness.
2070. Robert Wilson.
2117. William Webster.
2119. William Oldham.

Sealed November 7, 1856.

1100. Louis Beauché.
1101. George Simpson.
1105. Richard Archibald Brooman.
1142. Charles Gibson.
1146. John Cox.
1156. William Marychurch and John Griffiths.
1218. Alexandre Hubert.
1228. James Howard and George Williams Baker.
1246. Robert Adam Whytlaw and Alexander Mitchell, jun.
1256. Bennett Johns Heywood.
1282. John Weems and John Henderson McCrindell.
1416. Joseph Sutcliffe and James Leech.
2046. Edmund Pim Spiller.
2056. Eugene Armand Roy, John Archibald Hall, and William Thomas Binns.

Sealed November 11, 1856.

1141. Charles Henry Olivier.
1153. Charles Richard Williams.
1157. Matthew Townsend.
1176. Richard McCloy and John Hare.
1178. George Carter.
1212. Thomas Lawrence.
1229. Thomas Dawson Russum.
1251. André Adolphe Gaget.
1296. Robert Blackwood, sen.
1310. Edward Marsden.
1318. John Henry Johnson.
1406. Peter Armand Lecomte de Fontainemoreau.
1600. George Bradshaw Watkins.
1644. Alfred Nicholson Wornum.
1988. Edward Alfred Cowper.
2027. Thomas Pinfold Hawkins.
2162. Alfred Vincent Newton.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICE TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

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LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, *in the City of London*.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, *Dublin*; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1737.] SATURDAY, NOVEMBER 22, 1856. [PRICE 3D.

Edited by R. A. Brooman, 166, Fleet-street.

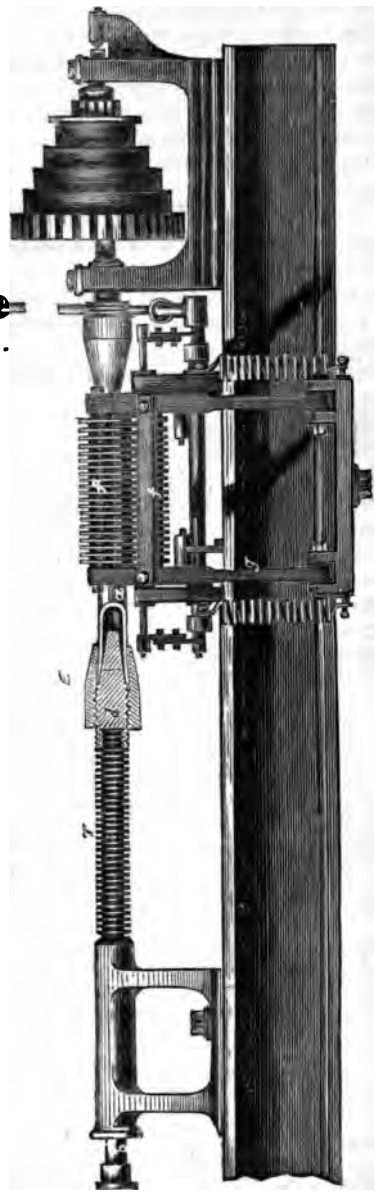
WEBSTER'S ELASTIC METALLIC TUBES.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.



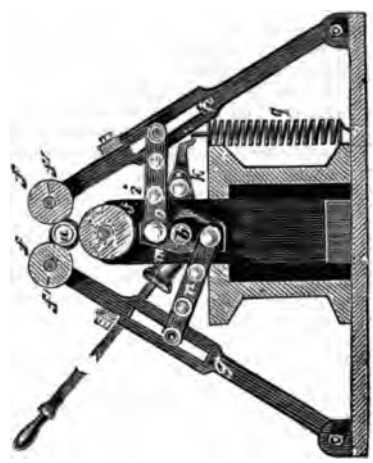


Fig. 5.

WEBSTER'S ELASTIC METALLIC TUBES.

MR. JAMES WEBSTER, of Birmingham, has patented a method of making elastic tubes suitable for effecting the junctions of pipes exposed to variable temperatures, or of pipes which are otherwise strained or required to bend, as the tube-couplings connecting locomotives with their tenders, hose for fire-engines, &c. The improved tubes are composed of brass, copper, or other metal or alloy, and in them a series of corrugations are made in planes perpendicular to the axis of the tube, to give elasticity to the tube, and permit of its flexure within certain limits. He prefers to make the corrugations as deep as is compatible with the nature of the metal or alloy of which the tube is made, and so narrow that the shoulders between the corrugations shall touch each other on slight flexure of the tube.

Figs. 1, 2, and 3 of the engravings on the preceding page illustrate the stages through which a plain or cylindrical tube passes in being converted into the improved elastic tube. The plain or cylindrical tube is first impressed or corrugated, in the manner represented in fig. 1. The corrugations are afterwards deepened as represented in fig. 2, and the tube is further compressed longitudinally, and the corrugations still further deepened, as in fig. 3. When the tube is only to be subjected to slight flexure it may be left in the state shown in fig. 1. Where greater elasticity is required, the deepening and narrowing of the corrugations may be carried to either of the stages shown in figs. 2 and 3.

The patentee manufactures the elastic tube by means of the machinery represented in side elevation in fig. 4, and in transverse section in fig. 5. This machinery constitutes the second part of Mr. Webster's invention. A piece of ordinary cylindrical tubing, *a*, is fixed at one end to the sliding shaft or axis, *b*, and at its other end to the axis of the lathe head, *c*. The manner of attaching the tube is as follows:—*d* is a conical plug affixed to the end of the axis, *b*; the plug, *d*, is forced into the end of the tube, *a*, and the collar, *e*, is screwed upon the plug, *d*, as represented, the end of the tube, *a*, is thereby grasped firmly between *d* and *e*; that end of the tube which is fixed to the axis, *c*, is secured in a similar manner. A series of rolls, *f*, *f*, are placed loosely upon axes, the said axes being supported on the arms, *g*, *g*, *h*, and *i*. The arms, *g*, *g*, and *h* are jointed to the bed of the machine, and the arm, *i*, is jointed to the lever, *k*, on the axis, *l*. *m* is a cross piece on the axis, *l*, to the vertical arms of which the arms, *g*, *g*, and *h* are respectively connected by links, *n*, *o*; *p* is an arm or lever fixed on the axis, *l*; *q*, *q*, are coiled springs, which acting upon the arm or lever, *k*, depress the said arm or lever, *k*, and by producing partial rotation of the axis, *l*, cause the separation of the rolls, *f*, *f*. By pressing upon the arm or lever *p*, the said rolls, *f*, *f*, are made to press at equi-distant points upon the tube, *a*. A piece of plain tube being fixed in the machine, a rapid rotatory motion is given to the said tube, and the lever, *p*, depressed, so as to bring the rolls, *f*, *f*, to bear against the said tube, *a*. The rolls, *f*, *f*, of a form suitable to produce depressions similar to those represented in fig. 1, are first used; and the depressions are afterwards deepened by the use of rolls narrower than those previously employed, placed on the axes, *f*, *f*. (Although Mr. Webster prefers to use three sets of rolls, acting simultaneously, and at equidistant points upon the tube, *a*, yet two, four, or other number of sets may be employed.) As the corrugations are formed and deepened, the tube, *a*, shortens, and the axis, *b*, slides in its bearing, so that it may follow the tube in its contraction. *r* is a helical or coiled spring, which, bearing against the cone, *d*, presses the said cone and axis, *b*, in the direction in which the tube contracts. The rolls *f*, *f*, besides rotating upon their axes, are capable of sliding thereon, so as to follow the corrugations, in which they work, as the said corrugations approach nearer to each other. Instead of rolls, *f*, *f*, burnishers or fixed pressing tools may be employed to press upon the tube and form the depressions therein. The use of rolls, as described, is however preferred.

Tubes made according to this invention are elastic, both longitudinally and transversely; that is to say, they are capable of elongation and flexure, within certain limits, without taking a set.

TONNAGE REGISTRATION AND STEAM SHIP CAPABILITY.

We desire to direct the attention of ship-builders, ship-owners, merchants, and, generally, of all who take an interest in the commercial marine of this country, to the following circular which has been issued by the Committee appointed by the British Association to consider the measurement of ships for tonnage, and other cognate questions. The course taken by the Committee will probably be greatly influenced by the manner in which the invitation given in this document is responded to; and we therefore hope it will meet with the best attention of the classes concerned.

We are enabled to state that the Earl of Hardwicke has been chosen Chairman of the Committee, and that Mr. James Yates, of Highgate, has been requested to join the Committee, and to act as its secretary, an office for which his scientific attainments well fit him, and one in which, from his residence in town and other circumstances, he will be able to render valuable service.

The Committee appointed by the British Association "to inquire into the defects of the present method, and to frame more perfect rules, for the Measurement and Registration of Ships and of Marine Engine power, in order that a correct and uniform principle of estimating the actual Carrying Capabilities and working power of Steam Ships may be adopted in their future Registration," being desirous to consider the matters referred to them in all their bearings, will be obliged by being apprised of the views of parties practically conversant with the matters referred to on any of the following points, and they request that communications thereon may be addressed to "The Secretary of the Tonnage Committee, Society of Arts, Adelphi, London," on or before Monday, December 1, 1856.

1st. To particularize the objects of public utility, Fiscal, Mercantile, Scientific, and Statistical, sought to be attained, or which may be promoted by a complete system of measurement, and comprehensive registration of the tonnage capabilities of ships, and of the engine capabilities of steam ships.

2nd. Admitting that the present system of tonnage admeasurement, as prescribed by the Merchant Shipping Act of 1854, giving the *internal roomage* of ships, affords useful data for registration so far as it goes, what are the additional details of admeasurement which are required to give the capability of ships for carrying *weight of cargo*, and in other respects necessary to render the official registration of Shipping, as periodically published by authority in the Mercantile Navy List, complete and effective for the objects of public utility above referred to.

3rd. To particularize in what respects the present system of Tonnage and Engine Power Admeasurement and Registration, as prescribed by Part 2nd of the Merchant Shipping Act of "1854," is deficient and not effective for the attainment of the objects of public utility above referred to.

4th. Following the example of limitations commonly prescribed by government in matters wherein public safety is concerned, such, for example, as protection from fire in Building Acts, what are the objections to the official assignment of some limit to the load draught of water, based on ordinary conditions of protection from wreck, at which ships may leave port; and presuming on the necessity for some limit being assigned which the draught of water may not exceed, by what rules may this limit be most correctly determined, and by what regulations may it be most effectually enforced without involving unnecessary interference with mercantile shipping transactions?

5th. In what respects is it commercially equitable, or in other respects advisable, to make a discriminative distinction between sailing ships and steamers in the measurement of the registered tonnage on which dues may be charged on shipping?

6th. In what respects is it commercially equitable, or in other respects advisable, in the measurement and calculation of registered tonnage, to make a discriminative distinction, based on the different materials (whether wood or iron, or a combination of both) with which ships may be built, or on the different principles of machinery (whether paddle wheel, screw propeller, paddle and screw combined, water jet, or other appliance) with which ships may be fitted?

7th. Seeing that no definite measure of power has been specially fixed by law as the statute unit of mechanical power (as has been done to regulate all other measures of quantity, as in the cases of the statute yard, the statute acre, the statute gallon, the statute pound, &c.), and seeing, moreover, that in the practice of trade, the "nominal horse power" of a steam ship does not define the measure of power available for the propulsion of the ship (the capability of engines for the production of working power with reference to their nominal horse power being notoriously, in some cases, the double of what it is in others), what steps should be taken to remedy this incongruity; and, presuming on its being determined to adopt some specific measure of power as the legalized standard unit of power, what definition, measure, or amount of power, should (in the opinion of the respective Members of this Committee) be adopted as the sta-

tute unit of marine engine power, and by what *name* should it be called, viz., whether "horse power," or "marine horse power," or "statute power," or "units of power," or other denomination?

8th. The respective Members of the Committee are requested to state their opinion whether it be advisable that any particular mode of prosecuting the details of measurement and working out the calculations thereof (such, for example, as Sterling's rule) should be prescribed by law for the measurement of ships, as is done by the Merchant Shipping Act of "1854;" or ought the system of taking the measurements and working out the calculations to be left to the discretion of the chief officer of the department on whom the responsibility for the scientific prosecution and accuracy of the calculations will professionally rest, as in the case of the astronomical calculations for the Nautical Almanac published by government, but for which the system of prosecuting the observations and deducing the calculations is not prescribed by law, but determined and improved from time to time, as may be, by the astronomer; and if it be considered that a prescribed mode of working out the calculations ought to be fixed and enforced by law, is the rule (Sterling's) now enforced by the Merchant Shipping Act the best rule now known and practised for calculating the cubature of ships?

HEARDER'S INDUCTION COIL.

In a former number (No. 1730) we noticed the success which had attended Mr. Hearder's labours in the improvement of the induction coil, and we have now to record a still further improvement which he has effected in this new and interesting instrument. The importance of the improvement is rendered greater from the consideration that the mode which has been adopted by Mr. Hearder seems to admit of indefinite extension. Hitherto increase of size has not been accompanied by a commensurate increase of power; and we are not aware that the largest induction coil constructed by M. Ruhmkorff has given a spark of 1 inch in length. Of the precise quantity of secondary wire employed by M. Ruhmkorff we have no definite information, but it is said to vary in his largest machines from 4 to 10 or 12 miles in length. Mr. Hearder has, however, now produced a machine which contains less than 3 miles of wire, and gives sparks in free air of nearly 3 inches in length with a battery of moderate power. Through an exhausted receiver of 3 feet in length, a brilliant ribbon *of light is* produced of the most gorgeous *hues*, the centre being bright and apparently encased in an atmosphere of crimson, shading off into violet and purple. Some new phenomena are also developed by Mr. Hearder's improved mode of insulation, such as the increased tension of the terminal proceeding from the inner end of the induced wire, the ignition of both electrodes instead of the negative only, as in M. Ruhmkorff's machine, &c. Great, however, as this advance may be, Mr. Hearder considers that it is only an indication that an almost unlimited amount of power may be obtained by extending the principles further.

We shall shortly be enabled to give a description of Mr. Hearder's coil.

THE EX-ATTORNEY GENERAL.

We desire to avail ourselves of the opportunity afforded by the recent elevation of Sir Alexander Cockburn to the Chief Justiceship of the Court of Common Pleas, for expressing our sense of the uniform fairness and courtesy with which his administration of the Patent-law, as Attorney-general, has been characterized. It is well known to our readers that the Attorney and Solicitor-general, as the law-officers of the Crown, have frequently to decide upon matters which greatly affect patentees and their agents, and that a want of good sense or temper in either of those officers may be productive of great annoyance and injury to such persons. In neither of these respects, however, has Sir Alexander Cockburn ever been wanting, and we have the satisfaction of adding, that we have excellent reason for believing that, in saying this, we are expressing a sentiment that is without exception on the part of others.

THE ARMAMENT OF THE "MERRIMAC."

FROM A CORRESPONDENT.

The determination of the armament most suitable to ships of war is a point which has lately attracted a good deal of attention, especially since the visit of the U. S. frigate, *Merrimac* to this country; and notwithstanding that copious information has already been given to the public in your pages, I think the following further "Notes" may possess interest.

To arm ships of war with heavy shell guns alone is decidedly improper, particularly if such ships do not possess great steam power and move with great speed. Heavy shell guns should be the exception, and not the rule. In the English service, this appears to be understood and acted upon. A frigate fitted with thirty-two 68-pounders on her gun deck, and sixteen 8-inch shell guns on her upper deck, with a

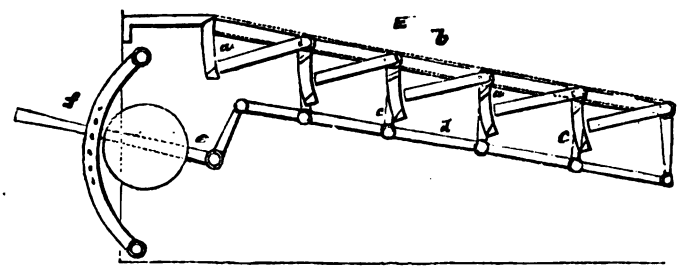
heavy shell gun (to carry an elongated shot) forward and another aft, would have a much more effective armament for all purposes than the *Merrimac*. For close quarters, a shell of an oblong form is already adopted in our own service. A ship armed with 68-pounder solid shot would command the *Merrimac* in respect of range; so that in fact it is only *at a certain distance* that a ship armed with 9-inch shell guns only, could be said to be even on an equality with another (of equal size) armed as I have suggested above; and if the latter had a superior speed as well, the former would stand a poor chance, either at long bowls or close quarters. Another point is, that the *Merrimac's* guns could not be worked with so much celerity as the 68-pounders.

There is another fact or two which it may be worth while to mention. The decks of our men of war have blocks of hard wood let in under the gun carriages to receive the friction; these, which are very useful, the *Merrimac* is without. Again, in consequence of the thinness of Dahlgren's guns in the chase, a single shot striking them in action would send them to shivers. Further, the elevating screws to the guns have been tried in our own service, and found not to answer, the female screw always going after a time; the screw itself is apt to get bent. It is a mistake to suppose that the substitution of bristles for sheepskins in the rammers is an improvement; on the contrary, the sheepskin serves much better than the bristles for one of the most important uses of the rammer, that of extinguishing the fire or sparks left in the gun after the discharge. Our own frigate *Shannon* steams at the rate of twelve knots an hour, and the *Merrimac* at about half that!

I may inform the "naval officer," whose interesting "notes" appeared *Mech. Mag.*, No. 1735, that we have frigates now in course of construction much larger and much more heavily armed than the *Shannon*. We have also a line of battle ship or two of a very pleasing character in course of preparation.

MASH'S FUSIBLE PLUGS AND FURNACE FIRE-BARS.

Mr. James Mash, of Manchester, professes to make the fusible plugs of steam boilers of a tapering form, and to place them so that the pressure to which they are subjected shall act against their smaller ends. His object in this arrangement is to prevent the more fusible metal of the alloy of which the plug is made from squeezing out, as it sometimes does, under the pressure of the steam, this expression of the more fusible metal being very dangerous, inasmuch as it leaves the plug of such a



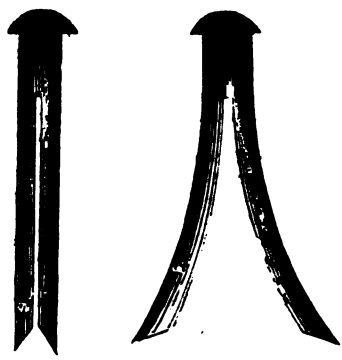
composition that it requires a higher temperature than was designed to melt it.

Mr. Mash also proposes to form and arrange the fire-bars of furnaces as illustrated in the accompanying engraving. The bed of the furnace or fire-place is formed of slabs or pieces, *a*, *a*, in place of the ordinary fire-bars; upon these the fuel is placed, and the combustion is effected. They are mounted in frames of iron or otherwise, so that pivots upon their ends move in bushes or holes in frames, *b*, at the sides of the furnace, and they are capable of being moved so that they may receive any desired degree of inclination. They are connected by levers, *c*, *c*, to the rod, *d*, which is attached to the bell-crank, *e*; this is weighted by a counterweight to the slabs; there is an arc, *f*, in connection, by which the slabs may be fixed in any desired position, as they may be raised to form one continuous right line surface, as shown by the dotted lines, or depressed, to assume nearly vertical positions. In front of each slab a grating or bars or openings are arranged for the admission of air to the fuel. The quantities of air admitted through the gratings may be regulated according to circumstances, simply by elevating or depressing the slabs; they also act as dampers in the same manner when partially or wholly raised. When it is requisite to clear the slabs from dust or other matters, they may be wholly depressed, so that everything on them will be passed into the ash pit.

WESTLEY'S EXPANDING SPIKES.

MR. WILLIAM WESTLEY, of Wellington, Derby, has patented the improved nail or spike shown in the annexed engravings. The body of the nail or spike is split into two legs or fangs, *a b*, fig. 1, which are chamfered or bevilled at their ends, the said bevilled

Fig. 1. Fig. 2.



ends constituting two wedges, the inclined faces of which are turned towards each other. In driving the nail or spike into wood or other substance, the wedge-shaped ends, in consequence of their inclined faces being turned towards each other, cause the two halves, *a b*, to open, in the manner represented in fig. 2, and thus fix themselves firmly in the material.

VAPOURLESS GLOW HEAT DISSEMINATOR.

"AMONGST the many methods of producing artificial heat, that by gas has of late years been most essayed, with more or less success, but the principles by which alone a pure and great heat could be insured, have been hitherto undiscovered." These are the words of Messrs. Wessel and Kukla, who appear convinced in their own minds that the grand secret has been reserved for them. Under the impression that our worthy German cousins had perhaps hit upon a something which was in advance of those attempts which they so cavalierly dismiss as abortive, we called in at 18, Hanover-square, to see one of their machines in operation. The apartment in which it is placed is a somewhat large one, being about 70 feet by 25. The apparatus is some 4 feet high, not unlike an Arnott stove, but much smaller. The gas consumed is 5 feet per hour. We held our head over the apparatus, and could not detect the slightest smell, and we found the *whole of* the apartment warmed with a comfortable temperature. The whole affair is *exceedingly* simple, but without a drawing we could not give a proper notion of its internal arrangement. This we may do, however, upon some future occasion, our object now being to make amends for an injustice in thought to a really excellent contrivance for giving a "pure and healthy" atmosphere to the interior of either palace or cottage. The prospectus from which we have quoted says, that by depriving the apparatus of the little cistern of water which affords the necessary humidity to the atmosphere, it is most efficient for drying rooms, and generally, where powerful heat and uniform temperature are required, without smoke or vapour, such as bakers' ovens, hothouses, baths, roasting, cooking, &c.

PATENT KNIFE AND FORK CLEANER.

MR. OLIVER LONG, of King William-street, City, has introduced a knife and fork cleaner, much wanted for those to whom the price of most others is beyond their means. It is simple in its arrangements, and can be operated upon by any one capable of being entrusted with sharp-edged instruments. The whole surface of the blades of the knives are thoroughly cleaned and polished at the same time without that wear, particularly of the backs of the blades, which is attendant upon the ordinary kind of knife cleaners. A peculiarly formed brush, and the dust of the common hearthstone, are used. The whole operation is one of great rapidity, and the construction of the apparatus almost insures it against the extremest probability of getting out of order.

The Iron Manufacture of Great Britain Theoretically and Practically Considered. By WILLIAM TRURAN, C.E. Illustrated by Twenty-three Plates of Furnaces and Machinery in Operation. London: E. and F. N. Spon, 16, Bucklersbury. 1856.

FROM circumstances which it is not necessary to mention here, this work, although it has been published a year, has not yet been noticed editorially in our pages. As the manufacture of iron has, however, recently become a subject of world-wide inquiry and consideration, we think it would be unwise still to defer its special introduction to our readers.

Among practical men there exists great impatience of the discourses of theorists, while among theorists we find an equal impatience of the self-sufficient views of practical men; and it must be acknowledged that, he is best fitted to impart scientific instruction to others in whose mind theoretical knowledge is corrected and made available by practical experience. For this

reason we receive with pleasure the volume of Mr. Truran, whose theoretical acquaintance with the iron manufacture is very considerable, while he has added to this the experience of many years, first as engineer of the Dowlais Ironworks, under Sir J. Guest, and subsequently as engineer at the Hirwain and Forest Works, under Mr. Crawshay. A person could scarcely possess greater advantages for improving his knowledge of that manufacture than he has thus had at some of the chief ironworks of the kingdom.

Mr. Truran has evidently been a careful and independent observer of manufacturing processes, but he has used his independence wisely, and abstained from crotchets, which are the bane of thinking practical men. His work treats of the raw materials used in the manufacture, the calcination of ores, the erection of the blast furnace and its appendages, the blowing-in of blast-furnaces, practical smelting, yield of materials, the blast, form of the interior of the furnace, the crude iron, the hot-blast, utilization of the gaseous products of the blast-furnace, the economy of heated air, the use of raw coal in blast-furnaces, blowing-engines, refining crude iron, converting cast into malleable iron, common bar-iron, finishing operations, the cost of raising minerals, &c. Each subject is treated fully, and in a practical manner. We should state that the historical discussion of the subject is altogether avoided. The author assigns as the cause of the omission the able treatment the matter has received in Mr. Scrivenor's "History of the Iron Trade," and the little interest taken in it by manufacturers and others.

In his chapter on the hot-blast, Mr. Truran boldly and ably assails the general exaggeration of the effects of this invention on the iron manufacture. He contends, with much reason, that the hot-blast has had ascribed to it, by most writers upon the subject, advantages which really belong to other improvements. He alleges that these writers represent that the great reductions which have been effected during the last twenty-five years in the quantities of fuel and flux employed to melt a given weight of iron, and the large increase of make from the furnaces, are entirely owing to the use of the hot-blast. "A number have gone so far," he says, "as to state that, by the mere substitution of heated air for the cold air formerly used, a saving of two-thirds the coal formerly required for smelting a ton of pig-iron was effected at the Scotch furnaces. Among them we notice the late Mr. Mushet. Before the adoption of the hot-blast, the consumption of coal at the Clyde Works, in smelting, is given by that author as averaging 7 tons 3 cwts. Now this appears to have been the consumption in the year 1797; for on another page we have 'Abstract of the Quantity of Materials required to Manufacture One Ton of Pig Iron at Clyde Blast-furnace No. 2, in 1797:

Coals for coking	7	8	0	4
Ironstone, raw	3	1	2	0
Iron ore..	0	2	0	0
Engine-coals, including coals for calcining ..	3	16	0	0
Limestone	0	17	1	4.'

"And then, to show the saving effected by a hot-blast, we are presented with the consumption of materials to produce one ton of iron in 1839, as being:

'Coals to the ton	2	3	2	0
Mine, calcined	2	6	2	0
Limestone	0	11	2	0.'

"Thus, after a period of forty-two years, there is a reduction of 5 tons of fuel on the ton of pig iron. This saving is at once carried to the credit of the hot blast. With all deference to such an authority on metallurgy, we respectfully submit that the reduction of fuel due to the use of heated air is more like 5 cwts. than 5 tons. If this saving of 5 tons justly belongs to the use of heated air, we must draw the inference that, in the forty-two years between 1797 and 1839, the iron manufacture remained stationary, with the exception of the impetus given to it by this invention. And yet we know that, during that period, numerous improvements were made in the preparation of the fuel and ore, in the furnaces, and in the blowing-engines."

This is sound reasoning. But the author proceeds much further, and shows that, with *cold* blast, a reduction of nearly two-thirds of the quantity of coal required to smelt a ton of pig-iron has been effected; that the use of carbonaceous ore, which melts at a low temperature, and requires but little limestone for fluxing, has enabled the consumption of coal to be much reduced; and that, by enlarging the throat of the furnace, the substitution of raw coal for coke was successfully effected, thereby enabling the consumption to be still further reduced.

We might, if we had space, adduce many other examples in which Mr. Truran has put forward novel views which prove him to be a careful and scrutinizing observer, and supported them in a way which shows that he is an efficient reasoner. At the same time his work contains some literary blemishes, betraying a little want of care in its composition or correction. These, however, are such as may very well be passed over by the readers of such a work.

Whatever may be now said to the contrary, there is not the smallest doubt about the great merits of Mr. Truran's volume. The information contained in it is so ample, so much in detail, so fully illustrated by excellent plates, and withal so reliable, that no person who understands the subject can fail to esteem it highly, while no one to whom the manufacture of iron is a serious study can afford to remain without it. In America as well as in this country it is very highly valued, and we regret that our own commendation of it has been so long deferred.

Mensuration of Lines, Areas, Surfaces, and Volumes, combining Elements of the Screw Propeller and Naval Architecture generally, with the Application of Algebra to Mensuration. Designed for the Use of Schools and Artizans. By ROBERT RAWSON, Esq., Head Master of the Dockyard-school, Portsmouth, &c., &c. London: Whitaker and Co. 1856.

THIS little work is written on much the same general plan as the "Exercises in Arithmetic," by the same author, noticed in No. 1661 of this Magazine. The remarks made by us in relation to the "Arithmetic" apply also to the present publication. The same praise and the same blame may be awarded to both performances, with this important exception, that the preface to the "Mensuration" is of a more useful and interesting character than that to the "Arithmetic." Mr. Rawson's position and experience are calculated to fit him for the preparation of works of this class—works adapted to the wants of the advanced pupils in our common schools, and of our intelligent artizans. The age of his pupils and the class to which they belong are such as to make it necessary for him to seek modes of teaching at once attractive and practical, and problems and illustrations, as exercises, exhibiting the application of his theories to their practice.

Thus we might expect that a book of this kind, coming from Mr. Rawson, would have some important merit of the kind hinted at. And the work to some extent justifies the expectation. There are, however, several faults of importance, which tend to lower our estimation of it. These we propose to point out as we go through the volume.

The definitions, postulates, and axioms from the First Book of Euclid are placed first. Here we remark that Def. 9 ought to have a figure which is omitted. We do not see the purpose of the postulates in connection with this book, as they do not limit *the operations* performed in the subsequent *practical geometry*. Next we have explanations of terms, in which the author declares his faith in negative slip in screw propulsion. "The reason for negative slip," says Mr. Rawson, "is not difficult to assign when it is remembered that the screw revolves in water at the stern of the vessel, which moves in the direction of the vessel's motion." We are sorry to find this error persisted in by Mr. Rawson. We agree with those who regard negative slip, when the screw is the *only* instrument of propulsion, as inconsistent with the known laws of mechanics. If we examine the conditions of a screw-ship when proceeding through the water uniformly, and under steam alone, we see first that the vessel, by impinging on the water at her bows, necessarily communicates to the fluid a motion in the same direction as her own; and if a velocity, V, be in this way impressed on a mass, M, per second, then a force tending to retard the motion will be derived from this source, and will amount to MV. Second, as the vessel in her course tends to leave behind the fluid at her stern, a stream flowing after her will be induced in her wake. Suppose the momentum thus impressed on the fluid per second to be denoted by M′V′, then this will indicate an additional retarding force of M′V′; and the total resistance will be measured by the sum of the two retarding forces, or

$$MV+M'V'.$$

The reaction on the screw must be exactly equal to this. Now it is pretty evident, we think, that if the screw be moving with a less velocity than the ship, it cannot destroy *all* the momentum of the following current. So that the reaction on the screw in that case must be less than M′V′, and so, *à-fortiori*, must be less than MV+M′V′; and, under such circumstances, uniform motion would be impossible. It is not the first time we have had to employ this argument. We can discover no flaw in it ourselves, and we recommend it to Mr. Rawson's notice, observing, that we think he should not have published this opinion of his in an elementary performance intended for the use of learners.

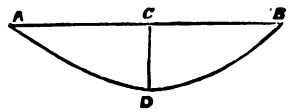
In the next paragraph is a very indifferent definition of the metacentre.

Curiously enough, following this there is a table of contents; and the first chapter after the contents is on practical geometry, in which many of the problems are very well done; for instance, the description of the pentagon, the hexagon, and the octagon on a given straight line.

Problem 23 is rather an anomalous one. It begins, "To describe a catenary," and ends by saying that no mode of solving it is known. At page 15 is a question com-

paring the lengths of the respective shadows of the Monument and St. Paul's, which is not very good, as the length of that of St. Paul's does not depend wholly on the height of the church.

On page 29 we have the following pair of equations in relation to the catenary:



Suppose ADB is a flexible chain of uniform section, suspended by its extremities from the two points, A and B, which are in the same horizontal line C, the middle point of AB, and CD perpendicular to AB, meeting the curve in D; therefore D is the lowest point in the catenary. Then the two equations given by Mr. Rawson are—

$$\text{The arc ADB} = 2\sqrt{DC^2 + 2\,DC.\,t}$$

$$BC = AC = t \log. \frac{DC + t + \sqrt{DC^2 + 2\,DC.\,t}}{t}$$

"where," says he, "t is the tension at D." Now, this is incorrect; for in order that these equations may hold, t must be, not the tension at D, which would be measured by a number of pounds, but the length of that quantity of the chain (of the same uniform weight per unit of length), the weight of which would equal the tension at D. Thus t must be the quotient of the tension divided by the weight of a unit of length of the chain.

On page 32 we observe the following problem:—The area of a triangle is equal to the sum of the base and perpendicular, and the base is 3 feet; find the perpendicular and area." This kind of solecism is of very frequent occurrence in these questions. There is hardly anything which has a greater tendency to puzzle and confuse a student than giving him problems containing such absurdities as this involves. Of course it is an absurdity to suppose that an area *can* be equal to the sum of two lines. There may be the same number of square units in the area as there are units of length in the two lines; but this is a very different thing from an equality of the two things—an area and a length—which have, indeed, no ratio to one another at all, and do not admit even of a comparison. On the next page are other questions involving the same irrational connections of lines and areas with each other.

In this chapter, Simpson's rule for obtaining the areas of irregular curves, has due prominence given it. We mention this as a commendation, the more deserved as a large number of examples are given to illustrate this important rule. On page 59, is the method of finding the metacentre of a floating body, in which we remark three faults. In the first place, Mr. Rawson calls the centre of buoyancy, "the centre of gravity immersed." Secondly, he says, "the conditions of stability are, the weight of the water displaced is equal to the weight of the floating body, and the line joining, P [the centre of buoyancy] with G [the centre of gravity of the floating body], is perpendicular to the water line, A B." Now these are the conditions of equilibrium and not those of stability. The condition of stability is, that the metacentre be above the centre of gravity. The third fault is, that the definition of the point I is omitted, the reader being left to divine that this point is the metacentre. On the two following pages we find some examples in this operation, one of which is fully worked out. But in these the term "tonnage" is put for "displacement," which is a widely different thing. Here, also, we meet a repetition of the error in the treatment of the catenary which has been already pointed out.

On page 64 the mensuration of solids commences, and the first notable point in this chapter is on its first page. Here it is: "When a body, such as a ship for instance, floats in water, it displaces a certain quantity of water. The quantity of water thus displaced is equal in weight to the floating body. Hence to find the displacement of a ship, it is only necessary to find the cubic feet of water, the weight of which is equal to the weight of the ship; this is done by dividing the weight of the ship in pounds by the weight of a cubic foot of water in pounds, and the quotient will be the displacement in cubic feet." This would be all very well if one knew independently the weight of the ship. But since we have no means of finding the weight of the ship till she is launched, and her displacement calculated from her form and draught of water, the above process does not seem of much use. Moreover, the pound is too small a unit for the expression of the weight of a ship; the ton is invariably used, the ton of water being thirty-five cubic feet.

On pages 74 and 75, are several questions involving incongruities such as we have shown to exist in a former chapter. From these we extract the following singular example: "The volume of a sphere is equal to its surface added to the circumference of a circle having the same diameter as the sphere; find its diameter, surface, and volume."

A volume equal to an area and a straight line added together! This is something less reasonable than saying that the velocity acquired by a falling body in a second of time is equal to the fifth note in the musical scale, as they are both denoted by the same letter of the alphabet!

On page 76, is given a rule for finding the surface of "a cone or pyramid," which is applicable only to the cone.

On page 79, to find the centre of gravity of a solid by Simpson's rule, the student is simply referred to the corresponding problem for a superficies. This must prove unintelligible, as there are some important distinctions between the two operations.

On page 85, we find the properties of Guldinus stated and illustrated to our satisfaction: these, notwithstanding their usefulness, have never before, to our knowledge, been given in a book on mensuration. We think Mr. Rawson has done well in introducing them here.

The next thing we notice is a collection of questions "Illustrative of the application of algebra to mensuration," almost all of which are of the objectionable character already twice condemned.

The rule of the Rev. Dr. Woolley for calculating the volume of an irregular solid, published in vol. 54 of this Magazine (but not acknowledged by Mr. Rawson), is in the main correctly stated, and efficiently illustrated.* The application of Simpson's rule to the various calculations of naval architecture is not so well done. It would be very difficult to learn to perform the operations from this exposition of them. The method given of finding the moment of stability of a vessel for a finite angle of inclination is more complicated, more laborious, and less accurate than that of Dr. Inman.

On pages 116—118 is an abstract, from Fincham's outline of ship-building, on the construction of men-of-war, which is so out of date as to be quite useless to the modern student of naval construction. No recently built man-of-war ship comes near the conditions here given as those of good specimens. Mr. Rawson has apparently quoted just those results of Mr. Fincham's experience which have now become obsolete. Let him attempt to apply his tests to the *Merrimac*, and he will be satisfied of the truth of what we advance.

The last fault we have to find has reference to page 120, and relates to a method of finding the centre of gravity of a ship experimentally; the account of it forms the last paragraph in the book. The fault is, that the account finishes so soon as to make it almost unintelligible, and therefore almost useless.

We must not conclude this notice without giving the author the praise due to his performance, in spite of the many defects we have pointed out. But for these defects (and we think we have mentioned all of them), the book would be especially adapted to the purpose for which it is designed. We have given great prominence to its faults, because they are such as certainly should not have occurred, are inexcusable, and ought not to be overlooked. But still we may heartily recommend the work to those to whom it is addressed; for though the errors it contains are calculated to embarras and perplex the student, they are not likely to mislead him, and at the same time there is much in it of a useful practical character, not to be found in a connected form elsewhere.

* In introducing Dr. Woolley's rule, Mr. Rawson says, "A ship is usually divided into equi-distant athwartship, or transverse vertical planes." This is erroneous; the ship is divided, or, more properly, supposed to be divided, *by* and not *into* planes.

THE BELL FOR THE HOUSES OF PARLIAMENT.

NOTWITHSTANDING the appearance of a leading article in the *Times* of Friday last on this subject, to the effect, that a distinguished lawyer, Mr. E. B. Denison, Q.C., had, fortunately for mankind, been specially raised up by Providence to restore the art of bell founding, and discover improvements in turret clocks, there are a few humble matters of fact which require to be brought forward, or the public may find, when too late, how little the anticipations, so modestly announced in the *Times*, have been realized.

In the first place, the chief fact, that the bell is intended for the clock, and will be struck by the clock hammer, and not by an immense clapper, appears to have been thrust into the back ground: for we were told, several weeks ago, that the bell had been tested with a clapper of 700 lbs., impelled by the force of five or six men, which had failed to bring out the full tone; and we are now informed that a clapper of 1,600 lbs. is being prepared for the purpose; and the same paragraphs lead us to understand that the official trial of the bell will be decided by this enormously disproportionate clapper, instead of by the clock hammer, with which it will have to be used.

On looking over the different Parliamentary returns on the subject, to ascertain the size of the clock, I find it is sufficiently large to lift a hammer 120 lbs., and give it a fall of six inches, with the clock going

eight days; and it is further stated, that this proportion of weight and fall will be amply sufficient to bring out the tone of the large bell, providing it is of an average quality. Indeed, instances are mentioned in which the proportions are much smaller, as it is stated that the great bell of Oxford, weighing 152 cwt., only requires to be struck by a hammer of 54 lbs., falling 4½ inches.

From the same returns we gather that the bell is to be supplied by the contractors subject to the approval of competent referees on the part of the Government, who will be deputed to ascertain if its merits are of the highest order, and if they are not, the bell is to be rejected. It is difficult to collect from the returns who the referees are at the present moment. At one time Mr. Denison and a gentleman nominated by him were appointed to the office, and more recently the duty appears to have devolved on Sir Charles Barry and Professor Wheatstone; but as other changes may have occurred, by which the responsibility no longer rests with the latter gentlemen, I think it better to make the following suggestions through the press, lest in the number of changes the duty of referee should fall to the ground and be reduced to a dead letter.

1. That the bell, before being finally tested, should be placed in the position it is to occupy in the tower, and then proved with a hammer of about 120 lbs. falling, by its own gravity alone, through a space of 6 inches; and as this is the force which will be employed upon the bell when in use, it is obviously that which should be employed in all the experiments that are to determine its fitness for the purpose it is intended for, and any effect which may be produced on the bell by a clapper of 1,600 lbs. urged by the force of five or six men through a space equal to the whole width of the mouth, should be regarded as altogether beside the principal question.

2. That if the quality of the tone proves satisfactory, the referees shall proceed to note its volume by stationing themselves at different distances from the tower in and about the neighbourhood of London, in order to compare the quantity of sound produced by this and other known bells, due allowance being made for the difference of size, the direction of the wind, and the state of the atmosphere, &c.

3. That as the bell has been designed by Mr. Denison, and if it should so fall out that he and his friend at present occupy the position of referees, it would afford more scope for impartiality in the judgment about to be pronounced if Mr. Denison, and perhaps his friend also, were to retire from the office, and leave the task of deciding on the merits of his work in other hands, particularly as this is the first public instance in which Mr. Denison's views on the subject have been brought to the test of practice.

E. T. Loseby.

London, Nov. 12, 1856.

PUBLIC WORKS AND THEIR CONSTRUCTORS.

THE GREAT LONDON SEWER AND ITS FAILURE HITHERTO.—WANT OF INDIVIDUAL CHARACTER IN THE MEN OF THE PRESENT AGE.

It would be an investigation worthy of every thinking person, though one somewhat alien to these pages, to learn why the old Romans, so many centuries before Christ, built a *Cloaca maxima* for a huge metropolis, while it was yet a small town—a sewer, in which a loaded cart and horses could circulate; and why the modern cities, London and Paris cannot boast of such a paramount commodity, of far more importance to the welfare of their millions of dwellers than the palaces of the mighty and rich. Now-a-days we have made a great advance in (the *theory* of) ledgers, cash books, cheques and counterchequ es, all which were not known in ancient times. Still, we have some records of the accounting business, of the building of the Pyramids even; when the workers were paid in onions and leeks. More detailed records have also reached us of the building of some mediæval German minsters and churches, some of the contributions to which were most extraordinary; children carrying slates from the river and receiving some refreshment for so doing, &c. But now nothing but heaps and tons of gold will answer the same purpose; and with all these, it has been observed that the stairs in the interior of the *Madeleine*, Paris, completed within only a few years, are already *worn out*.

A most curious fact may give us a cue, how to understand this discrepancy between old and new times. It has been observed, that those great architects, engineers, painters, sculptors, &c., who produced wonders, as it were, under the guidance and tutelage of Napoleon Bonaparte, became little and commonplace men after that guiding *star* had failed them. *Hinc illæ lacrymæ!* Genius and enthusiasm cannot be purchased nor extorted at will; they have their own origin, nature, and being. And then comes the question, whether the builders of St. Peter (Michael Angelo and Raffaelle), the builder of the Pont du St. Esprit on the Rhone, and numerous such great constructors and planners were rich and opulent men; whe-

ther they kept carriages, a host of servants, and so on. To cite only one analogous example, Goethe had no sofa in his cabinet (working room), and when Mrs. Goethe once placed a showy piece of furniture in it, the great poet had it removed, as disturbing and distracting his attention! We do not intend by far to advocate cynicism, or a niggard, shabby sort of existence; but whenever *great* things are to be done, they will never be done by men who care too much about *little* things; one excludes the other, always did. And thus comes the want of individuality—the want of great pronounced characters, which characterises the present age. We have plenty of deliberating and consultative bodies, *but* the executive power lacks energy and penetration. Many are the reasons for this anomaly, amongst which I chiefly rank an unmeaning, futile literature, and the physical deterioration of our generation. Whether, while the motors are of a weakly, uncertain potency, the motion impressed will be one of duration; whether, to put the case otherwise, our contract works will stand the brunt of time, might seem *one* of the questions *too* hazardous and ticklish to be broached in *print*. But they are now surely in the minds of many, and thus, to conclude, we may cite an *analogous* complaint, derived from the correspondence of a professional contemporary.

"At Gizeh we gazed marvel-fill'd
On pyramids, wondrous with mystery;
And we blush for the gimcracks we build,
Which will never perplex future history.
Our place-brick and road-drift metropolis,—
Zinc, compo, and like false pretences,—
One-half ever ready to topple is,
And t'other's not worth the expenses.

"Had Carnac, or Thebés, or Luxor,
Been built upon sixty-year leases,
Would Egyptians have built on such muck, sir,
That long since had tumbled to pieces?
I wot, such were likely their case,
And now they had not lived to moulder;
So away with the short building-lease,
Saith a staunch-building franchised freeholder."

J. Lotsky.

BESSEMER AND MARTIEN.

To the Editor of the Mechanics' Magazine.

Sir,—Sometime since, Mr. Truran compiled a book, which (without entering into details) was a praiseworthy effort for a person in his position. Unfortunately, he then appeared to imbibe the notion that the first office of an author was to commit assaults on all previous writers. Not a writer of any eminence in connection with iron smelting, has, I believe, escaped his active hands; his criticisms do not appear to have been thought worthy of any notice. It is true Professor Noad had to administer to him a severe castigation in the *Mining Journal*, about a year since, and in August last, not being aware how great was his determination to be in the wrong, I took the trouble to correct one of his misapprehensions in the same publication. With a perseverance in error, which almost seems characteristic of that species, who, brayed in a mortar, will come out as it went in, he is now attempting to revive all his mistakes over again in your columns. From his peculiarly erroneous manner of reading passages, I have thought he may be better versed in the Welsh than in the English language. He gives you this week a long quotation to prove that he was right in charging me with claiming, for my father, the invention of the Catalan forge. Any ordinary reader, wishing to understand what was written, when he read the statement quoted, "that Mr. Martien was attempting to realize the precarious process of manufacturing malleable iron direct from the ore, *first attempted by my late father sixty-two years since*, and imitated and re-imitated in the interval by countless patentees," would first have inquired what the process was which my father *first* attempted at that date, and which countless patentees have since imitated, and if he could not gather it from the passage, he would have referred to the letters, quoted further on, describing it. But Mr. Truran, with the determination to put himself in the wrong which seems his characteristic, chooses to read my words as signifying that my father sixty-two years since, first used the Catalan forge, a misrepresentation the more inexcusable, because Mr. Truran knows quite as well as I do, that the Catalan forge has *not*, since 1794, been imitated and re-imitated, by countless patentees.

Out of the same wanton love of misrepresentation, Mr. Truran, though no advocate of Mr. Bessemer, unites with his advocates in their attempt to show that, when I was writing on a subject which I stated had occupied *numerous patentees for sixty-two years*, that I referred to Martien's great novelty for purifying iron by an upblast of air without fuel, first patented in November, 1855! Need I say more to complete the exposure I made last week of Mr. Green.

I regret Mr. Truran should suffer annoyance at the pressing applications I received to assist the Renton Company. I could not help it. Mr. Truran's best way will be at once to address them, and make an offer of his superior services.

The attempt to represent me as a *hireling* who crushes poor inventors, is amusing.

There is no man living, as is well known, who has devoted more time and labour, *gratuitously*, to the defence of struggling merit and truth. My pen is always ready to vindicate the talented poor, and to expose the roguish rich. I heard lately that some wag had designated me the "public prosecutor" (much wanted by-the-bye); the "true inventor's friend" would have been quite as appropriate a title. It would have been more consistent with Mr. Truran's monitions if, in advocating the patent of Mr. Evans and Sir John Guest, he had related the fact that the invention was communicated to Mr. Evans in confidence by Mr. Leighton, and patented by the other two without his knowledge or consent. I shall have to refer to this patent presently, because it is upon its priority that Mr. Carpmael has attempted to justify his act of splitting up Mr. Martien's specification, and hospitably handing one half of it to another and a native client.

It is a constitutional fiction, that when an Act of Parliament has come into force, every individual is supposed to know its contents and be amenable to its provisions. But I am not aware it is equally assumed that every reader or purchaser of your Journal is legally held to be acquainted with the particulars of every patent published in your list. If there be a penalty attached to such ignorance, I must admit I have incurred it, through indolence, or through any other default which Mr. Truran may please to assign. I knew nothing of the nature of Mr. Bessemer's inventions until I read the Cheltenham manifesto, nor of Mr. Martien's until I read the letter of Mr. Avery, dated Paris, and published Aug. 23rd. Mr. Truran had better purchase a small treatise on the law of evidence. It would be rather altered if every printed book in the kingdom, or even in London, were held to be before the Court.

Had Mr. Truran possessed more discernment, and not devoted his attention so solely to his own mistakes, he would have perceived that my "new version" of the Bessemer affair appeared first on the 13th September, dated the 8th of the same month.

I may add, that I learn on evidence I am not disposed to doubt that Mr. Martien's intelligence and perseverance (for I have met no man more thoroughly versed in the practical science of iron-making) have carried the Renton process, "*first attempted by my late father*," to such economical perfection as to render it a great acquisition in those peculiar localities where ores proper for its use abound. Iron thus manufactured, without fusion, is well known to possess qualities of high value, and I trust Mr. Martien will reap the due reward of his perseverance and self-denying fidelity to the Renton Company.

I am, Sir, yours, &c.,
DAVID MUSHET.

TELEGRAPHIC COMMUNICATION.

To the Editor of the Mechanics' Magazine.

SIR,—As I do not know the address of the Atlantic Telegraphic Company, you will do me a great favour if you insert the following communication in next Saturday's *Mechanics' Magazine*.

To the Atlantic Telegraph Company.

Gentlemen,—It is possible to establish telegraphic communication between two distant points independently of electric or magnetic agency, yet more instantaneous in its action, simple in its details, inexpensive in its working, comparatively so in its construction, which may be worked by any two persons possessing a rudimentary knowledge of any language known to both, and last, though not least, should it suffer derangement, it admits of repair with facility. I will say, in conclusion, that I am prepared to submit drawings of the invention if called on to do so.

I am, Sir, yours, &c.,
WM. CARROLL.

5, Marshall-street, Openshaw, Manchester.

DR. LARDNER'S INVESTIGATION OF THE MOON'S MOTION.

To the Editor of the Mechanics' Magazine.

SIR,—I beg to remind "A Looker On," that the extent of my knowledge or ignorance of the laws of motion is totally irrelevant to the question in discussion, and that it would be well to confine himself to the consideration of the points raised by me in connection with *Dr. Lardner's interpretation* of those laws. Your correspondent ought to see that it is the learned Doctor's assumption he controverts instead of mine, in stating that "towards two directions at right angles to that in which the motion is made, there is no motion whatever," &c. Has he so soon forgotten Dr. Lardner's attributing to a body independent motions directed forwards, backwards, left, and right at the same time? Here, of course, the two last-mentioned directions are at *right angles to the first*. I must leave him to settle this point with the Doctor. It is assuredly no business of mine.

In commenting on my geometrical proposition about the circle, "A Looker On," accuses me of forgetting one little point,

namely, that the motion of the fixed extremity of the radius is not *absolute*, but *relative*. The truth is, I saw no occasion for the distinction. He, however, by help of his symbols, undertakes to show, that while the fixed extremity has no *absolute* velocity, it nevertheless has a *relative* velocity equal and opposite in direction to the velocity of the revolving extremity! I, for one, hardly wonder at his ingenious confession that he is "almost ashamed to insist" on such "elementary truths" as these being necessary to prevent your readers from being "misled" by my "sophisms."

I cannot help observing, in conclusion, that in addition to your correspondent's evident familiarity with the true signification of mathematical formulæ, his *logical* attainments are decidedly of no common order. Reduced to a syllogism, his argument stands thus: The absolute velocity of the second point *is w r*, consequently its relative velocity (the absolute velocity of the first point being *w* R,) is *w*(R—*r*); *therefore* (!) its absolute velocity *is w r*. This is, unquestionably, reasoning in a circle with a vengeance, in more senses than one.

I am, Sir, yours, &c.,

S. A. Good.

Pembroke Dock, Nov. 15, 1856.

PORTABLE WINDMILLS.

To the Editor of the Mechanics' Magazine.

Sir,—In a former volume of your useful periodical I find a correspondent asserts that *portable windmills* are much used in France. Could any of your readers give me the least information of the nature of them, their size, or construction, and efficacy, and where they are mostly to be found, they will greatly oblige very many of your readers, particularly your obedient servant,

S. S. Z. Z.

Bedford, October, 1856.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

Bird, T., and T. Rose. *Certain improvements in castors.* Dated Mar. 18, 1856. (No. 642.)

This invention consists in making the rolling parts of castors in the form of spheres or balls, having their upper parts pressing against smaller balls or spheres, the whole being enclosed in suitable frames, either with or without anti-friction rollers, pulleys, or balls. The frame of the castor is provided with a screw, in order to lengthen or shorten it when required to adjust the article of furniture to a proper height, and to uneven floors, which will be found peculiarly applicable to pianos, &c.

Rowley, E., and J. Hadley. *A new or improved method of shaping iron.* Dated Mar. 18, 1856. (No. 643.)

This invention relates to tapering bar-iron, and consists in placing the said iron, in a heated state, in a die or mould of the exact taper or form which is to be given to the iron, and subjecting the iron and die or mould, to the action of rolls, to press the heated iron into the die or mould.

Drury, J. *Improvements in steam boilers for preventing explosion thereof.* Dated Mar. 18, 1856. (No. 645.)

This invention consists in certain arrangements for effecting the following improvements in steam boilers:—1. For giving notice by a steam whistle when there is a deficiency of water in the boiler. 2. For extinguishing the furnace fire when there is such deficiency. 3. For admitting water into the boiler when the feed pump does not perform properly. 4. For determining the height of the water in the boiler, and causing the float employed for that purpose to operate upon other mechanical arrangements when there is too small a quantity of water in the boiler.

Appleton, P. *Improvements in knives for peeling apples, potatoes, and other fruits and roots.* Dated Mar. 18, 1856. (No. 649.)

This invention consists in attaching to the side of the blade of a knife a guard or plate, the edge of which is parallel with and projects slightly beyond the cutting edge of the blades.

Morgan, R. *A cellular purse.* Dated Mar. 19, 1856. (No. 651)

This invention consists in making purses with a series of cells forming the interior thereof, each cell being so formed as to hold a certain sized coin, and several sizes of cells so arranged as to hold the various denominations of coins.

Richardson, T., and G. W. Jaffreys. *Improvements in marine steam engines.* Dated Mar. 19, 1856. (No. 652.)

This invention consists in the combination of three direct-acting trunk cylinders in place of two as heretofore. The cylinders are placed in any position, and their piston rods are connected to cranks arranged to work at equal angles to each other.

Lacy, A. D. *Improvements in certain apparatus for taking up and delivering mail bags and other packages from a railway carriage or carriages whilst the train is in motion.* Dated Mar. 19, 1856. (No. 653.)

This invention was described and illustrated at page 385 of Number 1733.

Stott, E. S. *Improvements in the manufacture of mohair, alpaca, and worsted pile fabrics.* Dated Mar. 19, 1856. (No. 657.)

The pile surface, or face of each fabric, is made of mohair, alpaca, or worsted, as

heretofore. The weft of the fabric, in place of being of cotton or other vegetable fibre, is to be of wool waste, silk, or felting fibre. The fabrics are subjected to the process of milling or felting, and subsequently to the action of steam, and afterwards the pile is cropped or cut.

COPE, D. *A new or improved manufacture of spoons, forks, and ladles.* Dated Mar. 19, 1856. (No. 658.)

This invention consists in the manufacture of spoons, forks, and ladles from the metal zinc, or from alloys composed mainly of zinc.

NEWTON, A. V. *Improved means for separating substances of different specific gravities.* (A communication.) Dated Mar. 19, 1856. (No. 659.)

This invention relates to the separating of substances, by means of a blast of air which is forced upward through a stationary screen upon which the substances are placed, in such manner as to cause them to settle in layers upon the screen, one below another, according to their specific gravities, while by a suitable arrangement of the surface of the screen, and of a series of moving scrapers, a movement of the separated layers towards opposite ends of the screen is produced, to convey the separated substances away from each other.

HALL, J. B. *Improvements in preparing and treating pictures.* Dated Mar. 19, 1856. (No. 660.)

The principle of this invention consists in uniting two or more engravings or photographs, &c., as the case may be, to form one picture. These are to be facsimiles, and are prepared so as to be rendered more or less transparent, according to the effect to be produced. Each picture being cemented to a plate of glass, they are to be so placed above each other that the lines will coincide. Various back-grounds may be formed.

PARSONS, C. F. *Machinery to be employed in the bleaching and dyeing of cloths, yarns, and fabrics.* Dated Mar. 19, 1856. (No. 661.)

This invention consists in the employment of cylinders, with certain appliances thereto, made to rotate in troughs containing the necessary liquids, and provided with brushes to cleanse, wash, and rub the surface of the cloth, yarn, or fabric; also of rollers for expressing the liquid, of drying cylinders, and, if necessary, of cylinders, rollers, or frames made to revolve in dyeing liquors when it is required to dye the fabrics.

BROOMAN, R. A. *Improvements in balance slide-valves.* (A communication.) Dated Mar. 19, 1856. (No. 662.)

This invention was described and illustrated at page 289 of No. 1729.

FONTAINEMOREAU, P. A. L. DE. *Improvements in looms for weaving.* (A communication.) Dated Mar. 20, 1856. (No. 664.)

This invention consists in improved apparatus to be used as a substitute for the lettering sticks of weavers, and for stretching woven fabrics in the direction of their width during the operation of weaving. It cannot be described without engravings.

BURTON, J. W., and G. PYE. *Improvements in treating flax, hemp, and other fibrous matters, requiring like treatment.* Dated Mar. 20, 1856. (No. 666.)

The flax, &c., are treated in such manner as to separate the boon or woody parts, which the patentees find may be advantageously employed in preparing food for animals, by reducing it to a powder or meal, and by combining it with linseed, which they do by boiling linseed in water, and mixing therewith the boon or woody parts above-mentioned, and forming the compound into cakes or moulded shapes for food. Another part of the invention consists of treating the fibrous parts of flax, &c., by subjecting the same to the action of water, impregnated or combined with fuller's earth, and with steam, and then boiling the fibrous matters.

SCHAEFFER, W. C. T. *An improvement in treating soap-suds and wash-waters.* Dated Mar. 20, 1856. (No. 667.)

This invention consists in applying clay or aluminous earth and sulphuric acid for precipitating or separating the oily and fatty matters from such waters.

TRUEMAN, J. *Improvements in ovens for baking.* Dated Mar. 20, 1856. (No. 669.)

In this invention the heat is applied externally to the oven. The body of the oven consists of a chamber of iron, surrounded by brickwork, a space being left between the two for the free circulation of the heated air which passes off by a flue or chimney in the centre above the oven. The bottom of the oven is laid with sheets of iron, carrying a layer of sand and tiles or slabs of stone. The oven is heated by a small stove placed in a chamber immediately below, which may be fitted with a deflector for the purpose of diffusing the heat more evenly. The supply of atmospheric air to the furnace is obtained from a number of pipes or passages which open at their converging ends into an air chamber immediately below the grate, whilst their outer ends may be conducted outside the oven or building.

DRUMMOND, W. *Improvements in spring hinges for swing doors.* Dated Mar. 20, 1856. (No. 670.)

This invention consists in constructing spring hinges for swing doors in such manner that the door is suspended on a pivot,

and the spring is made to press together two inclined surfaces of such form as to cause the door to close, although opened in either direction.

MURPHY, J. *Improvements in means or apparatus for stopping or retarding vehicles used on rail or other roads, which improvements are also applicable to the brake wheels in connection with stationary engines.* Dated Mar. 22, 1856. (No. 671.)

This invention, the main feature of which consists in an arrangement of steam pipes, cannot well be described without engravings.

BRIERLEY, W., and J. P. *Improvements in looms for weaving.* Dated Mar. 22, 1856. (No. 673.)

This invention relates to the "rising boxes" used for changing the shuttles, and consists in a method of working them by the direct action or beat-up of the lathe, and an arrangement of apparatus in connection therewith, being self-acting, and capable of adjustment, whereby a change of shuttles, to the number of six, can be made at any desired pick or shoot of weft.

GLOVER, W. *Improvements in the construction and arrangement of machinery or apparatus, for damping and beetling woven fabrics.* Dated Mar. 22, 1856. (No. 674.)

To the ordinary calander or embossing machine the patentee adds a metal shell or roller, with a rough, fluted, or spiral surface. Between this shell and the calender roller the material to be operated upon passes, and receives the requisite impression known as "watering" or "waving." Over the roller on which the material is wound he places a number of beaters, working either inclined or vertically in slides, the number to correspond with the width of the material. At the front and back of the calender machine, and opposite the said beaters, he fixes cams, wipers, or spiral or screw-shaped rollers, with projections opposite each beater, so that, as the said rollers revolve, each projection, coming in contact with one of the beaters when intended to do so, raises it up, and then releasing itself by the revolving motion, allows the beater to fall on the material which is being wound on the roller. By this plan the calendering or embossing and beetling processes are performed at the same time, and by one apparatus.

PRATT, H. *Certain improvements in the construction of union mills, and in the application of the motive-power apparatus, and machinery connected with the manufacture of flour and bread, parts of which are also applicable for other useful purposes.* Dated Mar. 22, 1856. (No. 675.)

The patentee describes various improvements in the mode of constructing union mills, as also in the manner of obtaining and applying the motive power necessary for the economic working of such mills, as well as in the general means he proposes using for receiving and preparing grain, the grinding it into flour, and the making it into bread. The arrangements cannot be described without illustrations.

JOHNSON, J. H. *Improvements in weaving by electric power, and in the machinery or apparatus employed therein.* (A communication.) Dated Mar. 22, 1856. (No. 677.)

This invention, which is very comprehensive, cannot be described without illustrations.

JONES, J., and A. C. SHIRREFF. *Improvements in the construction and application of rotatory motive power engines and pumps.* Dated Mar. 22, 1856. (No. 678.)

These engines consist in each case of a fixed external steam cylinder or working chamber, disposed with its axis in a horizontal direction, and having two end covers with central stuffing boxes through which the rotating power shaft passes to the machinery to be driven. This cylinder is truly bored out, and has within it a smaller hollow cylinder or rotating drum truly turned externally, and disposed with its axis eccentrically placed as regards the axis of the fixed external cylinder, or so that it shall bear close up against one side of the fixed cylinder's bore, as the bottom side for example. This internal cylinder has in it, or attached to it, three radial sliding pistons or working diaphragms, inserted into radial slots in the cylinder, and packed both at the sides and outer end with adjustable metallic packing. The hollow of the internal cylinder contains a longitudinally disposed roller which forms the bearing surface for the inner ends of the set of pistons, the three pistons being continually in contact with the roller at their inner ends, and with the outer cylinder's bore at their outer ends. The sides of the pistons bearing against the end covers of the external cylinder are packed by means of a circular plate set up by spiral springs and set screws, aided by the admission of steam between the plates and the end covers.

JOHNSON, J. H. *Improvements in electro-magnetic printing telegraphs.* (A communication.) Dated Mar. 22, 1856. (No. 679.)

This invention relates to certain improved mechanism for the obtainment of a recording instrument, capable by suitable modifications of marking either a conventional alphabet in the form of symbols, or of printing the ordinary alphabet in Roman or other letters.

BRIERLEY, H. *Improvements in self-acting mules for spinning and doubling.* Dated Mar. 22, 1856. (No. 680.)

This invention consists—1. Of certain mechanism for the purpose of governing the winding-on motion of the self-acting mule, that is, regulating the amount of motion given to the spindle in winding on in accordance with the different dimensions which the cop assumes during its formation. 2. Of certain mechanism for bringing the backing-off cones, or other apparatus used for that purpose, into and out of action, and for gearing and ungearing the drawing up motion of the carriage.

HINKS, J., and G. WELLS. *Improvements in metallic pens and pen-holders.* Dated Mar. 22, 1856. (No. 681).

The patentees place upon the back of the pen a saddle piece, secured by turning round the edge of the pen. The saddle piece carries a dome-like projection which hangs over the back of the pen. When the pen is dipped into ink, the dome becomes filled, and on the removal of the pen, the ink is retained by capillary attraction between the dome and the back of the pen. In making pen-holders, they pierce the blank of which the metallic part of the holder is made, so that the blade is nearly divided transversely into two parts, held together by two necks. When the blank is made cylindrical, it has great elasticity.

SCHELHORN, G. G. A. L. M. *A new or improved pen-holder.* Dated Mar. 22, 1856. (No. 682).

The patentee describes a pen-holder, in which the pen is held by being pressed against the concave surface of the metallic tube of the pen-holder, by means of vulcanised caoutchouc or similar substance.

BARLOW, W. H. *Improvements in covering and constructing bridges, viaducts, floors, and other structures of a like nature, when iron is used.* Dated Mar. 22, 1856. (No. 684.)

Corrugated structures of iron are employed in place of wood planking, and floor girders are formed without other beams or girders, and the combination of the parts is such that the horizontal parts which resist by tension do not come under the horizontal parts which resist compression.

JUCKES, J. *Improvements in furnace-bars.* Dated Mar. 22, 1856. (No. 686).

This invention was described at page 465 of our last Number, (No. 1736.)

HEATON, T. *Improvements in self-acting doors and gateways.* Dated Mar. 22, 1856. (No. 690.)

This invention relates to various modes or methods of causing doors or gates to open or close in any direction by the weight of the waggon, carriage, or other substance, acting upon levers, rails, or platforms, in conjunction with certain mechanical contrivances, thereby dispensing with the necessity of persons to attend them.

BRYANT, J., jun. *Improvements in machinery or apparatus for the reburning of animal charcoal.* Dated Mar. 24, 1856. (No. 691.)

The retort is inclosed in brickwork, and heated by a suitable furnace beneath, communicating with flues which encircle the retort. A reciprocating or reversing rotary motion on its axis is imparted to the retort during the process of reburning, whereby the animal charcoal is kept constantly stirred or agitated, and will therefore be more efficiently acted upon by the heat. For this purpose the retort is suspended by an endless chain passing round an over-head pulley, the back end being further supported by a trunnion. A suitable outlet is passed through the centre of the trunnion to carry off the foul air and vapour arising from the charcoal.

ROBERTSON, J. *Improvements in transmitting motive power.* Dated Mar. 22, 1856. (No. 692.)

This invention, or its main feature, was described and illustrated at page 511 of Vol. 64, No. 1712.

BROWN, P. and G. *An improved ash-pan for fire-grates.* Dated Mar. 24, 1856. (No. 694.)

This invention consists—1. In the use of a sifter, separator, or grid in combination with a pan (or stone) used for the reception of dust, cinders, &c., such separator or sifter being employed for separating the dust and refuse arising from the fire from the larger cinders and particles of coal falling therefrom; and 2, in the use of ribs or bars of metal forming the heat reflectors for reflectors and screens, and also for covering in the ash-pan to prevent the dust arising during the operation of separating.

HUSBAND, R. *Certain improvements in the manufacture of hats.* Dated Mar. 24, 1856. (No. 695.)

This invention consists—1. In fitting and cementing each of the single fabrics separately, and with the junction of its ends in such situation that the cemented strip of neither fabric shall overlie that of any other at any point of junction. 2. In providing that the "tip" need neither be fixed before the completion of the body, nor be sewed to any side lining, but may be effectually fixed singly, and at any convenient time.

TYSOE, J. and C., and P. FOXCROFT. *Certain improvements in machinery or apparatus for roving, spinning, and doubling cotton and other fibrous substances.* Dated Mar. 24, 1856. (No. 696.)

This invention applies—1. To the method of driving the spindles (as commonly used) in roving, spinning, and doubling machines, and driving the flyers in spinning and doubling machines, when constructed as hereafter described; and 2, to the spindle

and flyer of throstles and doubling frames. The latter part of the invention consists in the substitution of a fixed stud or pin, in place of the running spindle as commonly used, and also a new description of flyer to be employed therewith in spinning and doubling. The new mode of driving is as follows: And endless band or strap is first driven by a pulley communicating with the main driving part of the machine, which endless band is guided around the spindles or wharved flyers by other pulleys or drums, and is also carried from one side of the machine to the other (to drive the opposite row of spindles or flyers) by means of another guide pulley at the end of the machine, this pulley being adjustable in its bearings, in order to tighten up the band, and impart an uniform and requisite degree of tension to enable it to drive the spindles, &c.

PITT, W., and E. T. DAVIES. *Improvements in the manufacture of brackets and castors for furniture.* Dated Mar. 24, 1856. (No. 697.)

This invention consists in making these articles of metal less costly than brass, or of zinc, and afterwards coating them with brass, and gilding them, if required, by electro-deposition.

CLAY, W. *Improvements in the manufacture of wrought or bar iron.* Dated Mar. 24, 1856. (No. 698.)

This invention was described at page 318 of No. 1730.

NEWTON, W. E. *Certain improvements in cranes.* (A communication.) Dated Mar. 24, 1856. (No. 700.)

This invention was fully described and illustrated at page 433 of No. 1735.

FOSTER, W. *Improvements in looms for weaving.* Dated Mar. 25, 1856. (No. 705.)

This invention consists in an arrangement for working revolving shuttle-boxes, which may be easily attached to the end or side of any ordinary power loom, whereby a more simple and economic mode of working the shuttles for producing checked goods is obtained than can be effected by the ordinary existing arrangements.

JOHNSON, J. H. *Improvements in machinery or apparatus for raising nap or pile.* (A communication.) Dated Mar. 25, 1856. (No. 706.)

This invention relates to gig mills for raising the nap or pile on cloth or woollen fabrics. The apparatus is so arranged that it may either be used separately to raise the nap or pile, crosswise or transversely, only without joining or combining it with an ordinary lengthway raising gig mill, or it may be combined with an ordinary longitudinal nap machine, and made to raise the nap both crosswise or transversely and longitudinally at the same time, which will be found of great importance. The motion imparted to the teazles or their equivalents in this apparatus is made to resemble, as much as possible, the motion of the teazles in cross-napping by hand. The raising cylinder, which rotates in suitable bearings, is moved at the same time, in such a manner as to nap the cloth transversely at those places where it comes in contact with it.

DUNNICLIFFE, J. D., and S. BATES. *Improvements in the manufacture of twist lace and weavings.* Dated Mar. 25, 1856. (No. 707).

This invention consists in arranging machinery so that some of the warp threads may be caused to move from back to front, and from front to back of the machines, as well as the bobbin or carriage threads, whilst other of the warp threads, as heretofore, are moved from end to end of the machines.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

SMITH, W. *Improvements in the means of economising heat in locomotive engines.* (A communication.) Dated Mar. 18, 1856. (No. 648.)

This invention consists in the introduction of a system of flues in locomotive engines, in order to obtain a longer circulation of the flame and hot air for the purpose of abstracting thoroughly the caloric. This is attained by applying partitions or divisions to divide the tube into three parts or series, causing the heat to pass first through the lower tubes, then back to the fire-place through some of the tubes of the second series, and finally into the chimney through the highest tube. Two flattened funnels or flues are placed one on each side of the engine with their mouths or apertures forward, and their conveying pipe opening under the fire grate. The lower part of the fire-box is fitted with a similar arrangement.

COHEN, B. S. *An improvement in the manufacture of chimney-pieces, shop-fronts, pillars, pilasters, slabs, vases, and ornamental parts of buildings.* Dated Mar. 19, 1856. (No. 654.)

Fuller's earth is ground with water, and rendered into a plastic state, and when desired is mixed with colouring or other matters to produce different effects, and the same is then moulded or formed by pressure in or by moulds or dies. The articles are then fired or burned in kilns or ovens.

STERLING, J. D. M. *Improvements in steel and its manufacture.* Dated Mar. 19, 1856. (No. 655.)

The inventor takes equal parts of cast iron and wrought iron suited for steel

making, and of good quality, and melts the cast iron in any convenient manner, and pours it upon the wrought iron previously reduced into small portions, and cools it. It is afterwards broken up and melted once or oftener with as pure an oxide of iron as can be obtained in such quantities as will give the requisite quality. The oxides of zinc and tin, manganese, chromium, and of other metals, will produce the same effect on this as on steel made in the ordinary way, the oxide of tin hardening, and the oxide of zinc strengthening; metallic tin and zinc can also be employed. The resulting compound is to be treated by tilting and rolling in the same way as other cast steel.

COHEN, B. S. *An improvement in the manufacture of penholders, handles, knobs, finger-plates, and umbrella and parasol furniture.* Dated Mar. 19, 1856. (No. 656.)

Fuller's earth is ground and rendered into a plastic state, and when desired is mixed with colouring or other matters to produce different effects, and the same is then moulded in moulds or dies. The articles are then fired or burned in kilns or ovens.

LEIGHTON, J. *A luminous fire-place and self-supplying smoke-consumer.* Dated Mar. 20, 1856. (No. 663.)

This fire-place is constructed with a chamber at the back and sides for coking the coals. This chamber is covered in at all parts, except that in communication with the fire, leaving no vent for the gas and bituminous smoke but into the fire.

WADSWORTH, J. *Improvements in the ventilation of mines, or in the means of removing noxious gases therefrom, and in machinery or apparatus to be used for that purpose.* Dated Mar. 20, 1856. (No. 665.)

The first part of this invention consists in a process for removing gases or vapours from the higher cavities of mines (wherein they generally accumulate), and directing them into some adjacent air course, by the atmospheric current of which they are carried off and dissipated. The inventor accomplishes this by the use of an air pump, bellows, or fan, placed by means of pipes in communication with the reservoir of gas, on the one hand, and with the air passage on the other. The design and arrangement of a portable apparatus for conveniently carrying on the above process forms the second part of the invention.

STIRLING, J. D. M. *Improvements in mounting heavy ordnance for naval purposes.* (A communication.) Dated Mar. 20, 1856. (No. 668.)

This invention (M. Delvigne's) was described at page 348 of No. 1731.

BROOKES, G. H. *Improvements in stoves, grates, or fire-places.* Dated Mar. 22, 1856. (No. 672.)

The inventor proposes conducting the smoke through an aperture on each side of the stove, grate, or fire-place, and attaches to such apertures flues or vents for the conducting away of the smoke, and for the increasing and regulating of the draft, which draft will be regulated also by means of doors or valves in the flues or vents; also by the back portion of the stove, grate, or fire-place being so constructed as to be moved backward or forward.

COCKINGS, J. S. *An improved envelope, and which said envelope he proposes designating as the despatch or return envelope.* Dated Mar. 22, 1856. (No. 676.)

These improvements mainly consist in making envelopes with an additional fly or leaf, by which means the envelope may be used a second time.

CAREY, C. *Improvements in shower baths.* Dated Mar 22, 1856. (No. 683.)

In the improved shower bath the vessel to contain the water is arranged to slide up and down in the frame, so that it may be lowered down for a person to pour in the water, and then, by means of a bar and two cords, chains, or straps, be raised to its position, the bar being passed under two hooks or stops to retain the vessel at its highest position.

CAREY, C. *Improvements in the vessels and filters used for making infusions of coffee and other substances.* Dated Mar. 22, 1856. (No. 685.)

The coffee pot (or other vessel) is formed internally with a projecting rib or stop just below the outlet passage. On to this stop an open frame, covered with suitable fabric for filtering the infusion is placed, and such frame is made to fit so close, as to prevent the passage of the fluid except through the filtering medium. The infusion is first prepared in the pot, and then before pouring it out the framed filter is introduced, the fluid portion alone passing through the filter.

CAREY, C. *Improvements in presses for copying letters and other documents, and for other uses.* Dated Mar. 22, 1856. (No. 687.)

In the improved presses two metal plates are used. At each of the four angles of one is fixed an upright male screw, and through the four angles of the other are formed holes which will admit these male screws. On the upper parts of the screws are nuts, each having a handle.

BARBER, E. *Improvements in mangles.* Dated Mar. 22, 1856. (No. 688.)

The first form of the improved mangles consists of a cylinder (fixed in standards), in the interior of which a series of rollers

working round a spindle, and supported at either end by a grooved disk, are caused to rotate, and to which pressure is applied. The second form consists of a cylinder suitably supported, around which a series of rollers are caused to rotate, and to which also pressure is applied. The third form consists of four rollers revolving in grooved standards.

CAREY, C. *An improvement in omnibuses.* Dated Mar. 22, 1856. (No. 689.)

This improvement has reference to omnibus seats when divided by partitions, and consists of having one or more of such partitions readily removed and again fixed, in order that a stout person may be accommodated.

BROWN, P. and G. *Certain improvements in sizeing and stiffening textile materials or fabrics by the application of new materials for those purposes.* Dated Mar. 24, 1856. (No. 693.)

This invention consists in the employment for sizing and stiffening of "dari," frequently called "millet," which is to be prepared like rice, or by simply washing, if preferred, and to be properly damped so as to render it capable of being sufficiently pulverized, when it is to be ground into flour with an admixture of about two per cent. of alum, and is fit for use in the ordinary manner.

NEWTON, W. E. *An improved coupling for connecting carriages, locomotives, and all vehicles used on railways.* (A communication.) Dated Mar. 24, 1856. (No. 699.)

This coupling is self-connecting when the carriages are run up to each other on the line. One of the connecting links is made in the same way as the ordinary coupling link, and when about to be coupled the end thereof is brought against curved or cam pieces of the corresponding part of the coupling, and there by lifts up the coupling pin, and allows the link to pass under it. The pin then falls into the link, and the latter cannot be withdrawn until the pin is lifted up again. The cam or curved pieces are so arranged that when the link is any great distance out of a straight line, as it would be if one of the carriages were to run off the line, then the link would come under the cam pieces, and lift up them as well as the coupling pin, and the link would then be free to be drawn away from the coupling, and would, therefore, be easily detached in case of any accident.

CAUNCE, R. *Improvements in the machines for spinning called mules.* Dated Mar. 25, 1856. (No. 701.)

This invention consists in connecting the faller shaft to the setting-on rod, by means of a lever on the faller shaft acting on a finger on the setting-on rod, whereby the driving strap for giving the requisite motion for taking out the carriage is moved on to the driving pulley when the faller wire is at the top of the spindles.

BROMLEY, J., and W. ADAMS. *Improvements in ovens used for firing porcelain and other kinds of earthenware.* Dated Mar. 25, 1856. (No. 702.)

The inventors fire the bottom and centre of the oven by flues from one half the mouths thereof, and the outer rings and top of the oven by flues from the other half of the mouths. They allow of no communication between the flues for firing the bottom and centre, and those for firing the outer rings and top of the oven. By these improvements they also exclude cold air from the oven.

PROVISIONAL PROTECTIONS.

Dated September 15, 1856.

2152. Félix Moreau, of Rue de l'Echiquier, Paris, gentleman. Improvements applicable to the tops of omnibuses and other carriages.

Dated October 1, 1856.

2290. Pierre Armand Lecomte de Fontainemoreau, of Rue de l'Echiquier, Paris. An improved voltaic battery. A communication.

Dated October 3, 1856.

2321. Blanche Palmire Mosqueron, widow, Vilcoq, of Paris and Essex-street, Strand. An improved lamp oil.

Dated October 9, 1856.

2363. William Stettinius Clark, of High Holborn. Improvements in the construction of churns for producing butter. A communication.

2370. John Shaw and Edwin Shaw, of Glossop, musical instrument makers. Certain improvements in pianofortes, organs, harmoniums, and other similar keyed musical instruments.

Dated October 11, 1856.

2385. Anton Bruno Selthen, of Alpha-place, Caledonian-road, engineer. Improvements in machinery or apparatus for cutting cork in the process of shaping and making stoppers of cork, and in the treatment of cork to be employed in the said processes, and to be applied to other useful purposes.

Dated October 17, 1856.

2428. George Wilson, of Glasgow, manufacturer. Improvements in power looms.

Dated October 20, 1856.

2455. Robert George Barrow, of Wade-street, Poplar, engineer. A self-maintaining motive power obtained from water, air, or any other fluid or liquid.

2459. Charles Robert Freeman, of Eaton, Norwich, and William Drake Key, of Norwich. Improvements in manufacturing food for animals.

Dated October 22, 1856.

2479. Carl Heinrich Julius Wilhem Maximilian Liebmann, of Fartown, Huddersfield, warehouseman. An improvement in purifying water. A communication.

Dated October 23, 1856.

George Edward Johns, of Falcon-street, , box manufacturer. The application and tion of an optical or stereoscopic arrange- the manufacture of boxes.

Dated October 25, 1856.

William Benson, of Four Stones, near m, Northumberland, coal owner and lime . Improvements in apparatus for drying eeds, and other substances.

. Joseph Sexton, of Leicester-square, gen- . Improvements in the construction of holders applicable also to the holding of halks, and other marking materials.

. Thomas Brown, of Fenchurch-street. rements in capstans and windlasses.

Dated October 27, 1856.

. Benjamin Ferrey, of Trinity-place, Char- s, architect. An improvement in pro- ornamental plastering or stucco work.

. John Birkin, of West Bridgeford, Notting- Improvements in dressing and cleaning and other grain.

. Hugo Frederick Forbes, of Florence, Tus- and of Essex-street, Strand, gentleman. proved copying press.

. Thomas Allan, of Adelphi-terrace, West- r, engineer. Improvements in the perma- ay of railways.

. Philipp Schäfer and Frederick Schäfer, f Brewer-street, Middlesex, manufacturers. proved handle for desks, deed and despatch bags, furniture, and other articles to which s are applied.

. William Edward Newton, of Chancery- civil engineer. Improved means of econo- the waste heat of furnaces or fire-places. munication.

. Michel Dognin, of Lyons, France, mer- Improvements in machinery for making net.

Dated October 28, 1856.

. William Brodie, of Belhaven, N. B., brick le manufacturer. Improvements in the ma- ure or production of roofing tiles.

. Edward Thornhill Simpson, of Wakefield, naker. Improvements in the manufacture p.

. Adolphe Ernest Ragon, of Bernard-street, ll-square. Improvements in apparatus for ting and recording the speed of ships. A unication.

. William Septimus Losh, of Wreay Syke, erland, esquire. Improvements in the pre- on of size, which may also be used as a proof varnish or coating.

. Jean Louis Marie, manufacturer, of Paris. vements in raising, propelling, and forcing and other fluids, and in obtaining motive r.

. William Armand Gilbee, of South-street, ury. Improvements in the construction of e-consuming furnaces. A communication.

. Joseph Armstrong, of Normanton, York, eer. Improvements in the permanent way lways.

. Samuel Russell, of Sheffield, metal manu- rer. Improvements in the manufacture of t handles, knobs, door-plates, finger-plates, scales, and knife handles.

. James Kinder Cheetham, of Rochdale, r of medicine. Improvements in the manu- re of iron and steel.

. Adolphe Aubril, of Newman-street, Ox- street, chymist. The novel application of a n root to the manufacture of starch, paper, ardboard.

Dated October 29, 1856.

2535. Richard Hampson, of Rochdale, cotton spinner. Improvements in lubricating steam engines.

2537. Thomas Eyre Wyche, of Camberwell, gentleman. A method of disengaging metals from the matrix. Partly a communication.

2539. Thomas Clutton Salt, of Birmingham, manufacturer. A new or improved method of coating with glass or enamelling surfaces of cast iron.

2541. Thomas Smith Henzell, of South Shields, Durham, ship owner. Improvements in the construction of ships or vessels.

2543. William Kopke, of Hackney, gentleman. An improved clasp-board to hold documents for reference.

2545. Peter Fairbairn, of Leeds, machine manufacturer, and Robert Newton, of Liverpool, gentleman. Improvements in machinery for dressing waste silk.

2547. John Thomas Way, of Welbeck-street, Middlesex. Improvements in obtaining light by electricity.

2549. John Macallum, of the Kames Gunpowder Mills, Argyle. Improvements in the preparation or refining of saltpetre.

Dated October 30, 1856.

2551. Constantine John Baptist Torassa, of Genoa. An apparatus for calculating the speed of vessels at sea, as well as obtaining the extent of their destination caused by the side winds.

2553. John Gibbon, of Northfleet, Kent, clerk. Improvements in chaff cutting machines.

2555. Louis Urion, of Nancy, France, manufacturer. Improvements in match boxes or holders.

Dated October 31, 1856.

2556. Charles Augustus Ferguson, of Mill Wall, Poplar, mast maker. Improvements in preparing timber for ship-building, mast-making, and other purposes.

2557. John Lawson, of Glasgow. Improvements in the manufacture of pile and other fabrics.

2560. Francis Cook Matthews, of Great Driffield, York, manufacturing chemist. Improvements in preparing manure.

2561. Samuel Worssam, of Chelsea, engineer, and John Grist, of Islington, engineer. Improvements in machinery for cutting and shaping wood.

2562. Henry Hutton, of Reading, Berks, engineer. Improvements in lubricators.

Dated November 1, 1856.

2563. Edward Joseph Hughes, of Manchester. An improved mode or method of concentrating the colouring matter of certain vegetable substances.

2564. Joseph Browne, of Liverpool, master mariner. Improvements in the construction and working of ships' windlasses and capstans, part of which improvements are also applicable for steering ships and other vessels.

2566. Benjamin Stott, of Salford, near Manchester, manager. Improvements in machinery or apparatus for preparing, spinning, and doubling cotton, wool, flax, or other fibrous materials.

2567. John Young, of Wolverhampton, manufacturer. Improvements in flooring cramps and lifting jacks.

2568. John Parbery, saddler and harness maker, of Northampton. Certain improvements in horse collars.

2569. James Coul Sinclair, of Elgin, N. B., accountant. Improvements in treating, preparing, and drying agricultural produce.

2570. Thomas Ainsley Cook, of the Walker Alkali Works, Newcastle-on-Tyne, manufacturing

chymist. Improvements in treating manganese ores.

2571. John Warne, of Blackfriars-road, beer engine manufacturer. Improvements in beer engines.

2572. Josiah Stone, of New Cross, Kent, engineer. Improvements in the construction of force pumps.

2573. William Henry Moore, of Wenlock-place, City-road. Improvements in railway signals.

2574. William Joseph Curtis, of Sebbon-street, Islington, civil engineer. Improvements in lighting and ventilating railway carriages.

Dated November 3, 1856.

2575. John Jobson, of Litchurch, Derby, ironfounder. Improvements in the manufacture of railway chairs.

2576. Samuel Tearne, japanner, of Birmingham, and George William Richmond, artist, also of Birmingham. Certain improvements in producing ornamental designs on the surfaces of fancy and other goods made of papier maché, wood, glass, china, earthenware, tin, iron, or other such like materials, the surfaces of which, when made up, are usually finished by staining, varnishing, painting, or japanning.

2577. James Nasmyth and Robert Wilson, both of Patricroft, near Manchester, engineers. Improvements in hydraulic pumps and presses for packing cotton and other articles of the like nature.

2578. Samuel Middleton, of Porter-street, Newport-market. Improvements in the manufacture of certain articles of leather without seams.

2579. John White, of Glasgow, merchant. Improvements in preparing for spinning cotton and other fibrous substances.

2581. Ebenezer Erskine Scott, of Dundee. Improvements in stereoscopes.

2582. William King Westly, of Leeds, flax machinist. An improved method of, and machinery for, heckling, combing, drawing, and preparing fibrous substances for spinning.

2583. John Kirkham, of Tonbridge-place, Newroad, civil engineer. Improvements in the construction of furnaces, ovens, or kilns, for drying, baking, or burning pottery, earthenware, bricks, tiles, or other similar articles, and in the means of collecting and condensing the smoke, gases, or vapours evolved from the fuel in such or other furnaces or fire-places, or that escapes from the retorts and other parts of the apparatus used in the manufacture of gas.

Dated November 4, 1856.

2584. Joshua Murgatroyd, of Stockport, Chester, engineer. Improvements in machinery or apparatus for spinning, cleaning, doubling, and throwing silk, part of which improvements are applicable to machinery for roving and doubling cotton and other fibrous substances.

2585. Henry Bessemer, of Queen-street-place, New Cannon-street. Improvements in the manufacture of rails, or railway bars, and axles.

2586. Ethan Campbell, of Boston, U. S. A. A new and useful or improved apparatus for propelling a navigable vessel.

2587. William Gray and John Tate, of Newcastle-on-Tyne, joiners. Improvements in apparatus for washing.

2588. Joseph Jessop, of West-gate, Bradford, York. Improvements in machinery for washing, wringing, and mangling.

2589. Samuel Cotton, of Broughton, near Manchester, machinist. An improved mode or method of regulating or governing litt, tilt, or other hammers worked by mechanical power.

2590. William Edward Newton, of Chancery-lane, civil engineer. Improved machinery for riming and tapping gas fittings. A communication.

2591. William Edward Newton, of Chancery-lane, civil engineer. Improved machinery for sweeping floors, streets, and walks. A communication.

Dated November 5, 1856.

2593. William Weild, of Manchester, machinist. Improvements in velvet or cut pile fabrics and in looms or machinery used for weaving such velvet and other loop pile fabrics.

2595. William Edward Wiley, of Birmingham, pen and pencil manufacturer. Improvements in pen holders.

2597. James Fernihough, of Dukinfield, Chester, boiler maker and iron founder, and Robert Farrow, of Leek, Stafford, engineer. A self-acting apparatus for regulating the supply of atmospheric air to furnaces, gas stoves, and other closed vessels used for the consumption of fuel or combustible gases by preventing the formation of smoke therefrom, and thereby economising such fuel or combustible gases.

2599. William Clissold, of Dudbridge, Gloucester, engineer. Improved apparatus for regulating the supply of water to water-wheels.

2601. Henry Hill, of Stepney, lock maker. An improvement in locks for bags, and other like articles.

2603. Robert William Sievier, of Upper Holloway, gentleman. An improvement in the mode of treating saccharine juices in the manufacture of sugar.

2605. William Seed, of Preston, spindle and flyer maker, and William Ryder, of Bolton-le-Moors, spindle and flyer maker. Improvements in certain parts of machinery for slubbing and roving cotton and other fibrous materials.

2607. William Blackwell, of Settle, York, agriculturalist. Improvements in ploughs.

2609. George Collier, of Halifax. Improvements in drying, stretching, and polishing or finishing yarns.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," November 18th, 1856.)

1610. A. Herts. An improved sheet metal bending and tubing machine. A communication.

1619. G. Darlington and J. Darlington. Improvements in the manufacture or production of zinc or spelter.

1624. W. Robertson. Improvements in machines for spinning and doubling cotton and other fibrous substances, such machines being of the kinds commonly known as mules and twiners or doublers, and in the means of weighting rollers in the same and other machinery.

1629. H. Adcock. An improvement in casting iron and other metal.

1631. J. Marsh and J. Catt. Improvements in the manufacture of certain textile fabrics.

1633. S. Hardacre. A compound conical spike and spiral double gridded machine for opening, blowing, scutching, and cleaning cotton, wool, and other fibrous substances.

1635. J. Fowler, jun., and W. Worby. Improvements in machinery for ploughing and tilling land by steam.

1639. J. Westwood. Improvements in hand, roof, and other railway lamps, parts of which are also applicable to certain descriptions of oil lamps for general purposes.

1642. J. B. D. Chevalier and N. Rabouin-O'Sullivan. A new or improved method of obtaining or preparing printing surfaces, and in printing therefrom.

1643. E. H. C. Monkton. The application of a means or process for destroying grubs and other

insects or animalculæ or infusoria injurious to plants.

1645. B. F. Ortet. A new metallic composition applicable to the coating of surfaces and to the moulding and casting of various objects.

1646. T. M. Hartwell, J. W. Gladwin, and H. Gladwin. Improvements in machinery or apparatus for stretching woven fabrics.

1654. C. Burrell. Improvements in arranging and rendering portable apparatus suitable for distilling from beetroot and other vegetable substances. Partly a communication.

1662. E. Leigh. Improvements in the mode or method of generating steam, and applying it for the purpose of obtaining motive power. Partly a communication.

1665. J. H. Johnson. Improvements in apparatus for consuming smoke, to be applied to lamps and gas burners. A communication.

1670. H. Turner. Improvements in cutting hides for making flexible pipes, and for certain other purposes.

1677. J. H. Johnson. Improvements in circular looms. A communication.

1684. The Rev. G. Jacque. Improvements in the construction of stringed musical instruments.

1724. W. Green. Improvements in treating, ornamenting, and waterproofing fabrics, and in machinery or apparatus for effecting the same.

1727. J. Bing. A new sauce-boat or vessel for containing liquids of different densities.

1755. C. Burton. Improvements in warming houses and other buildings.

1766. E. Lord, T. Lord, A. Lord, and W. Lord. Improvements in machinery for opening, blowing, scutching, and preparing cotton and other fibrous substances.

1768. T. Byford. Improvements in horses' bits.

1769. R. Stewart. Improvements in cutting stone and other mineral substances.

1786. H. Robinson. Improvements in arrangements and mechanism for the conveyance or transport of loads or weights.

1794. W. E. Newton. Certain improvements in the process of generating illuminating gas. A communication.

1836. G. Walker and J. Scrimgeour. Improvements in spinning frames.

1862. W. Green. Improvements in the manufacture or production of fabrics and surfaces, in imitation of, and as substitutes for, leather for bookbinding and other uses, and in machinery or apparatus for effecting the same.

1943. J. H. Johnson. Improvements in steam engines. A communication.

1948. J. Laleman. Improved machinery for combing flax and other similar fibrous materials. A communication.

2015. J. H. Johnson. Improvements in fire-arms. A communication.

2246. H. J. M. F. Silvy and A. A. H. Plagniol. Improvements in harness.

2266. W. Smith and N. F. Taylor. Improvements in apparatus for measuring gas and other fluids, and in regulating the flow of the same.

2277. M. Hickson. Improvements in waterproofing certain woven fabrics.

2313. M. T. Crofton. An apparatus for indicating and registering the number of persons entering a public vehicle or carriage.

2329. W. Preston. Improved machinery to be used in the manufacture of paper-hangings.

2341. W. N. Parsson. An improved construction of rotary sawing machine.

2349. W. Marriott and D. Sugden. An improvement in purifying coal gas.

2363. W. S. Clark. Improvements in the construction of churns for producing butter. A communication.

2367. C. Burton. Improvements in machinery for washing and cleansing fabrics and clothes.

2399. J. Stephen. Improvements in steam boilers and furnaces.

2402. S. Bremner. Improvements in pouches or envelopes, and in machinery or apparatus for manufacturing or producing the same.

2428. G. Wilson. Improvements in power looms.

2451. Sir F. C. Knowles. Improvements in the manufacture of iron and steel, and in the preparation of fuel used therein.

2454. J. Young. An improved ventilator.

2455. R. G. Barrow. A self-maintaining motive power obtained from water, air, or any other fluid or liquid.

2463. W. Clay and J. Harris. Improvements in the manufacture of iron and steel.

2478. G. Webster and J. Webster. Improvements in the means of opening and closing the slide valves of engines worked by steam or other power.

2486. G. E. Johns. The application and adaptation of an optical or stereoscopic arrangement in the manufacture of boxes.

2492. J. Walley. Improvements in the means of preventing explosions of steam boilers.

2493. J. D. Dunnicliff and W. Dexter. Improvements in warp-machinery.

2527. W. S. Losh. Improvements in the preparation of size, which may also be used as a waterproof varnish or coating.

2544. C. De Jongh. An improved method of, and machinery for, combing and preparing silk, flax, and other fibrous substances.

2545. P. Fairbairn and R. Newton. Improvements in machinery for dressing waste silk.

2556. C. A. Ferguson. Improvements in preparing timber for ship-building, mast-making, and other purposes.

2570. T. A. Cook. Improvements in treating manganese ores.

2586. E. Campbell. A new and useful or improved apparatus for propelling a navigable vessel.

2595. W. E. Wiley. Improvements in penholders.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1853.

2627. William Austin.
2634. Henry Willis.
2639. William Smith.
2641. Charles de Bergue.
2656. David Pratt.
2680. James Melville.
2682. Moses Poole.
2768. Prix Charles Jean Baptiste Sochet.

LIST OF SEALED PATENTS.

Sealed November 14, 1856.

1138. Uriah Scott.
1145. William Evans.
1148. William Norris and Robert King.
1149. James Young Simpson and Wyville Thomson.
1151. Robert Foulds and William Bracewell.
1159. William Thistlethwaite.
1166. Richard Coleman.
1167. David Curwood.

1171. Louis Cornides.
1172. Johan Jacob Meyer.
1175. Richard Knight.
1187. William Maugham.
1225. Germain Barruel.
1261. John Roberts.
1262. Thomas Charlton and William Turnbull.
1263. James Baird.
1292. Henry Bessemer.
1293. William Gossage.
1308. James Nasmyth and James Brown.
1507. James Aikman.
1815. Thomas Wicksteed.
1952. Joseph Crossley and James Bolton.
1977. William Webb.
2051. John Morrison and Samuel Amphlet.
2121. John Blythe Robinson.

Sealed November 18, 1856.

1191. James Anning Gollop.
1199. Robert Pemberton.
1209. Macleroy Neilson.
1220. William Richelieu Hodges.
1222. Alexandre Tolhausen.
1237. John Gedge.
1307. Delia Avery.
1329. Reuben Boyce Wigley.
1345. Duncan Lang.
1375. Richard Archibald Brooman.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

ERRATUM.—Last No., p. 464, col. 2, line 19 from bottom, *for* Mr. Green, *read* Mr. Gowar.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

Replies to the inquiries of several correspondents will be given in our next.

The publication of several articles and letters is deferred.

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LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, *in the City of London*.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, *Dublin*; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1738.] SATURDAY, NOVEMBER 29, 1856. [PRICE 3D.

Edited by R. A. Brooman, 166, Fleet-street.

BARRAN'S IMPROVED STEAM ENGINES.

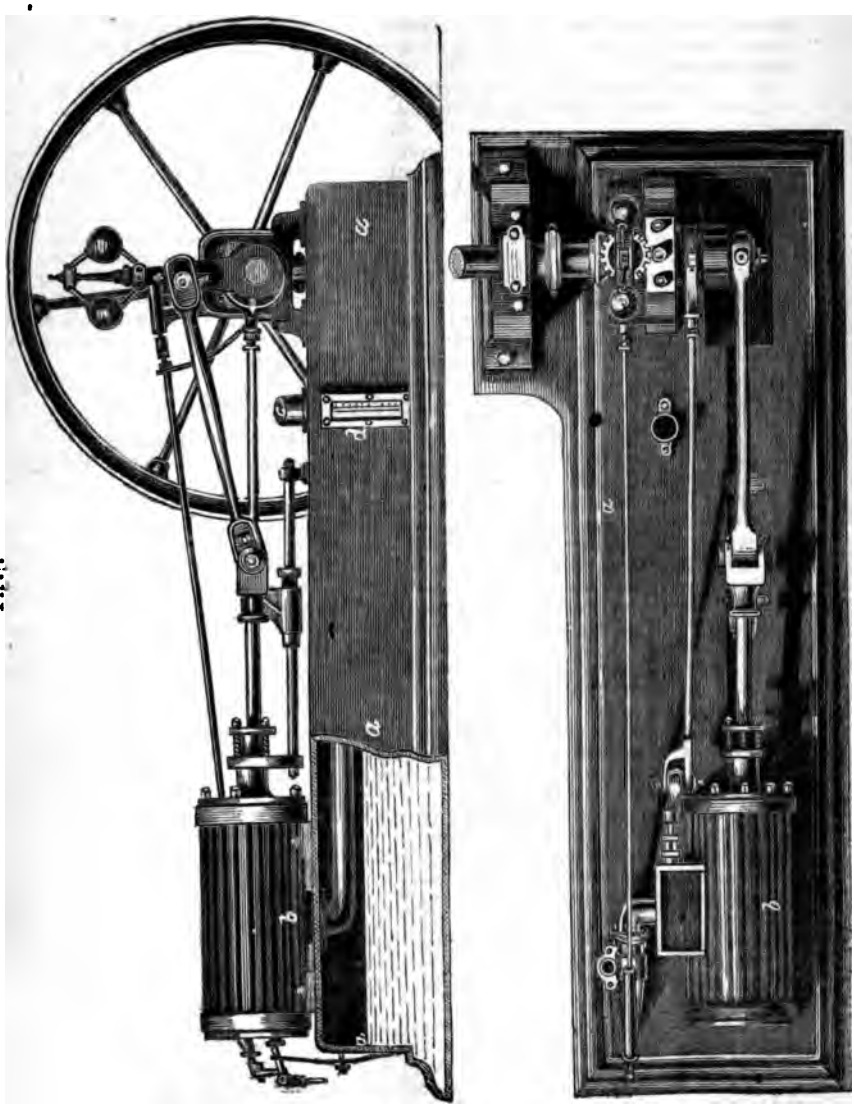

Fig. 1.

BARRAN'S IMPROVED STEAM ENGINES.

Mr. Joseph Barrans, the patentee of the improved steam engines, boilers, railway axle-boxes, &c., manufactured by Messrs. Hughes and Co., of the Railway Foundry, New Cross, has introduced a new and very convenient and economical arrangement of the parts of a steam engine. In place of employing an ordinary base plate and framing for the engine, the lower part or base (by which the engine and gearing are carried) is made into a hot-water tank. Near one end of this tank the steam cylinder is fixed in a horizontal position, and the bearings or carriages for the fly-wheel shaft are fixed near the other end of the tank. The cross head or end of the piston rod is guided by fixed guides. At the side of the hot water tank there is a glass water-guage, and, if desired, a thermometer. The exhaust steam passes from the steam cylinder into the tank, through tubes or other passages arranged in the water tank, by which means the water therein is heated by the exhaust steam.

Fig. 1 of the engravings on the preceding page shows a side elevation, and fig. 2, a plan of a steam engine so constructed. The arrangement preferred by Mr. Barrans is shown, but he makes no claim thereto, as other engines with different base plates or bases have before been constructed. The arrangement, also, of the engine may be varied without departing from his invention. *a*, *a*, is a tank, which constitutes the base of the engine; the shape of this tank may be varied, so long as it is made suitable for acting as a hot-water tank, and of having a horizontal steam cylinder and the bearing of the engine shaft fixed thereto, as shown. The exhaust steam passes from the steam cylinder, *b*, into the tank, and pervades the upper part thereof, or it passes through a pipe or pipes immersed in the water in the tank, so as to heat the water supplied thereto, by which a constant quantity of hot water is kept up, from which the boiler of the engine is supplied. *c* is an outlet for the waste steam, not condensed, to escape; *d* is a water guage to indicate the height of water in the tank. The novelty of the invention consists in the combining of a steam engine with a hot-water tank, as described.

INSTITUTION OF CIVIL ENGINEERS.

PRECARIOUS HEALTH OF THE PRESIDENT, R. STEPHENSON, ESQ., M.P.

On taking the chair at a recent Meeting of this Institution, the President said, that for some time past the state of his health had been so precarious, as to render it doubtful whether he could remain in England to be present at the first meeting of the Session; he had been extremely anxious on this point, as he wished to meet the members, before his departure on a journey which might have a duration of at least two months, and thus cause his absence at the period of the Annual General Meeting, when the election of the Council and Officers for the ensuing year would take place. He had been desirous of retiring at the expiration of the first year of office, but it had been represented to him that such a step might be prejudicial to the welfare of the Institution. That consideration, combined with the persuasions of the kind friends around him, induced him to abandon his previous determination, and to leave the matter in the hands of the general body. Therefore, if at the period of the election he was again honoured by the suffrages of the members, he should be happy to continue to preside over the Institution; but, on the other hand, if he was permitted to retire among the ranks of the past presidents, he should still hope to be constant in his attendance at the meetings, and to take an active part in the proceedings, which he considered was an imperative duty imposed on those who had been honoured by election to the presidential chair.

He thanked all those gentlemen who had contributed papers during the past year, and expressed a hope that they would be fully emulated during the present session. He mentioned Mr. Murray's Account of the Sunderland Docks, as deserving the careful study of all the junior members of the profession, being replete with useful information, giving the practical details of a large work which had been more than usually successful, and, as an example of dock engineering stood almost unrivalled in this country. The system of sluicing, or scouring of the entrance, particularly deserved attention.

He could not avoid also mentioning another paper, for which he felt under peculiar obligation, as it was produced almost entirely at his personal request—viz., the Explanation of the System of Mental Calculation which had been given by his friend Mr. Bidder, to whom he tendered his best thanks.

The President again thanked the members for their attendance, exhorted them to increased attention, and to the production of papers for reading at the meetings, which would be presided over by the Vice-Presidents during his absence, and cordially bade them adieu.

ON THE IMPROVEMENT OF RAILWAY LOCOMOTIVE STOCK, AND THE REDUCTION OF THE WORKING EXPENSES.*

BY DANIEL KINNEAR CLARK, ASSOC. INST. C.E.

IT is designed in this paper to discuss the locomotive engine; to consider some departments of practice which appear to be in a transition state; to endeavour to indicate how far, in some respects, the locomotive, even in its present advanced state, is susceptible of improvement: and to form some estimate of the pecuniary advantages thus derivable.

The locomotive is composed of three distinct elements—the boiler, the engine, and the carriage, comprising the frame and the wheels.

THE BOILER.

There are three important questions affecting the boiler open for discussion, with respect to fuel, to water, and to area of fire-grate and heating surface.

First, as to fuel.—The fuels in use in this country are coke and coal. In a paper read by the author before the Institution in 1853, it was shown, by a mechanical analysis, that the combustion of coke in the fire-box of the ordinary locomotive was practically complete, and that no expedients could improve the combustion of coke. These conclusions were subsequently corroborated by the results of a chemical analysis of the products of the combustion of coke in the engines of the Paris and Lyons railway by M. Ebelmen. He found that, under ordinary circumstances, the gases in the smoke-box consisted almost entirely of carbonic acid and nitrogen, with a mere trace of carbonic oxide, rarely exceeding two per cent.

Coal is a compound fuel, consisting chiefly of carbon and hydrogen; and the first condition of the perfect combustion of coal is that there should be a sufficient quantity of oxygen to satisfy the prior requirements of the hydrogen of the coal, and to take up the whole of the carbon precipitated by the hydrogen. There is a second and equally important condition, that the temperature should be elevated sufficiently to effect the union of the carbon and oxygen. If the hydrogen could be entirely driven off and consumed before the carbon is separated, smoke would not be produced.

The chief practical difficulty opposed to the fulfilment of these conditions consists in the irregularity of the supply of fuel to the furnace; because the presence of fresh fuel lowers for a time the general temperature, and also because, in certain conditions, it impedes the flow of air through the grate. The first and most direct preventive of smoke is a sufficiently strong draught to insure an ample supply of oxygen, and a sufficiently high average temperature in the fire-box to provide against the variable conditions of the elements concerned in combustion. When this remedy is not sufficient, means must be employed for equalizing the temperature, or as least for sustaining it above the point at which smoke is discharged.

The chemical theory of heating powers is incomplete with respect to compound fuels; for though the heating powers of the main elements, carbon and hydrogen, in their combining conditions have been determined—the former as a solid and the latter as a gas—it remains to be established how far the heating power of hydrogen as a gas represents that of hydrogen as a solid, which is the normal condition of hydrogen in coal. The hydrogen is gasefied previously to its union with oxygen, and involves the abstraction from the general fund of as much heat as is requisite for its preparatory conversion from a solid into a gas. This element being, to the best of the author's knowledge, as yet undetermined, he is led to disregard the theoretical heating powers assigned to various fuels by Playfair and De la Beche in the "Report on Coals suited to the Royal Navy," and to pass on to the results of working practice.

And, first, it seems to be established in general, irrespective of locomotive practice, that, with suitable arrangements, good coal may evaporate as much water as good coke, weight for weight; so that their working evaporative powers appear to be practically the same.

Second, that coke and coal demand distinct and peculiar methods of treatment, in order to the attainment of the best results from each. The recognition of this essential distinction in locomotive practice constitutes an era in the history of that wonderful machine, the most remarkable since the introduction of the link-motion by Mr. Stephenson.

The results of experiments made in 1854 with a M'Connell's boiler, corroborates the author's results from ordinary boilers, as they indicate the same proportions of efficiency between coke and coal; and they show that, though this boiler prevented smoke, it was not more efficient in the combustion of coal than ordinary boilers.

In the beginning of 1856 the author made several trials of one of Mr. Joseph Beattie's passenger-locomotives, the "Canute," on the London and South-Western Railway. The fire-box is large, and is divided transversely into two compartments by a mid-

* The substance of a paper read at the Institution of Civil Engineers.

feather. There is a combustion chamber in the barrel of the boiler, terminating in flue-tubes which proceed to the smoke-box. The back compartment of the fire-box is arched over with fire-bricks placed at intervals apart; the combustion chamber also is stocked with a faggot of perforated bricks placed at some distance clear of the tubes. Through these bricks the gases of combustion must pass on their way to the tubes; they receive and retain a portion of the heat from the passing gases, when the fuel is incandescent and smokeless, and give it out to the smoke discharged from the fresh coal; thus acting as equalizers of temperature, for the purpose of consuming the smoke. The feed-water heating apparatus is in two parts, placed within and above the smoke-box; when in operation, steam from the blast-pipe is exhausted into the condenser above, where it meets the jet of cold water thrown in by one of the pumps, and is condensed by it; the feed-water, thus heated, flows back into the tender, except what is intercepted by the other pump, with which a junction is made from the return flow-pipe for supplying the boiler. The water sent into the boiler passes on its way through the surcharging-chamber in the smoke-box, where it acquires a further increase of temperature previous to entering the boiler. The surcharging-chamber contains a number of tubes for heating surface; it is supplied with heat from the exhaust steam, which is thrown directly into it from the exhaust pipes on its way to the condenser. Thus, when the engine is at work, the feed-water is heated by the first process to or near the boiling point, and by the second process to some point above that, having some relation to the initial temperature of the exhaust steam. The superfluous feed-water discharged from the condenser returns to the tender, and raises the general temperature there.*

The trials with the "Canute" tested the performance of the engine with the usual express trains, and measured the economical advantages of the fire-bricks as smoke-consumers, and of the feed-water heating apparatus, the engine being tried, 1st. In its usual order, with coal, bricks, and hot-feed water; 2nd. With coal, bricks, and cold water; 3rd. With coke, bricks, and hot-feed water; 4th. With coal and hot-feed water, but without the bricks.

The coal used was Welsh, Griff, and Stavely coal. The first is rich in carbon, and is known as smokeless steam-coal; the second and third burn with considerable flame and smoke. The coals were delivered to the engine usually in equal quantities of one-half of Welsh coal, and the remainder of Griff and Stavely. The water supplied to the engine was clean and hard; it was neutralized by an allowance of muriate of ammonia put into the tender.

The performance of the engine with respect to the prevention of smoke was completely successful, and the engine did not require more than ordinary care and attention.

To test the utility of the bricks as smoke-preventers, they were entirely withdrawn from the boiler in some of the trials; and, without them, the smoke emitted was of a brown colour, and occasionally in such quantities as would certainly be called a nuisance. On restoring the bricks for the succeeding trials the smoke vanished; and the light gases discharged from the chimney, when the steam was not admitted, had precisely the appeance of the vapour from burning coke. Economically, the bricks were found to be of utility, as the evaporative power of the coal was, by its more perfect combustion, materially greater with than without the bricks; and the performance also was better.

The trials with coke alone as fuel showed, by a marked contrast, the superiority of the arrangements of the boiler for burning coal, as the evaporative power and performance of coke of excellent quality was, contrary to all ordinary experience, decidedly inferior to that of coal.

The trials with the feed-water heating apparatus were conclusive.

When coke was used instead of coal, the consumption was 20 lbs. per ton per mile, and one pound evaporated 7·35 lbs. of water;

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* The following are the particulars of the "Canute" passenger-engine:

Cylinder, 15 inches diameter, 21 inches stroke.
Driving-wheel, 6 feet 6 inches diameter.
Fire-box, inside dimensions—
  Length, 4 feet 11 inches.
  Breadth, 3 feet 6 inches.
  Depth at back, 5 feet 1 inch.
  Ditto at front, 4 feet 1 inch.
  Combustion-chamber, 3 feet 6 inches diameter, flat-roofed, 4 feet 2 inches in length.
Tubes, 373 in number—
  Outside diameter, 1¾ inches.
  Clearance between 7_{16} inch.
  Length between plates, 6 feet.
Ashpans, entrance, 3 feet 6½ inches long, 12 inches deep at the front, 9½ inches deep at the back.
Fire-grate, in two parts, 16 feet total area.
Heating surface, interior—
  Fire-box . . . . 107 square feet.
  Combustion-chamber 37 ditto.
  Tubes . . . . . 625 ditto.
  Total . . 769 ditto.
Fire-bricks—
  Gross weight, 5¾ cwt.
  Heating surface of bricks, in contact with smoke, 80 square feet.

indicating, in this particular class of engine, a direct advantage in favour of coal of 25 per cent. in consumption, and indirectly an advantage of 21½ per cent. by evaporative efficiency.

When the feed-water heating apparatus was disconnected, the consumption was 224 lbs. per mile per ton, and one pound of coal evaporated 8·24 lbs. of water; indicating directly an economy of fuel, due to the heating apparatus, of 33 per cent. in consumption, and indirectly 12 per cent. of economy by increased evaporative efficiency.

The inferior evaporative efficiency observed when using cold feed-water, is probably due to the dampers remaining wider open in order to keep up the steam, and so passing an excess of air. It may be also due, to some extent, to the loss of surplus heat, imparted to the heated feed-water in passing through the heating chamber inside the smoke-box.

Deducting the gain ascribed to the better use of the dampers, from the total gain, the balance (21 per cent.) would represent the gain by the using of the heating apparatus; and, by a little calculation, would be shown to indicate a high ratio of efficiency.

In forming a comparison of the performance of Beattie's engine with that of other engines in which coal is used as fuel, the evaporative efficiency of the fuel in the latter may fairly be expressed by 6 lbs. of water per pound of coal, whilst the former engine evaporated 9·35 lbs. of water per pound of coal; showing a superior evaporative efficiency of 3·35 lbs., representing an economy of fuel equal to 36 per cent.

Comparing Beattie's engine, then, as a coal-burning engine, with professed coke-burning engines, it is on a footing of equality with them, in evaporative efficiency of fuel, weight for weight.

By the employment of the feed-water heating apparatus, and by the more efficient use of the damper in conjunction with that apparatus, an economy of fuel, equal to 20 per cent., may safely be assumed, relatively to the consumption of fuel with cold feed-water.

With respect to other modes of heating the feed-water by the exhaust steam, the best is probably M'Connell's double blast-pipe, through which the feed-water is passed. Mr. Thomas Forsyth, who, whilst at Wolverton, had ample opportunity of becoming intimately acquainted with the working of the apparatus, states that the economy of fuel by the use of it is from 8 to 10 per cent.

The economical evaporative power of the boiler of the "Canute," in terms of the grate area and the heating surface, is equal to 51 cubic feet of water per hour, according to the formula,

$$c = \cdot 00222\left(\frac{h}{g}\right)^2$$

deduced by the author from his experience and observations with coke as fuel; in which c is the consumption of water in cubic feet per hour, at the rate of 9 lbs. per pound of fuel, h is the total inside heating surface in square feet, and g is the grate area in square feet. A greater evaporative performance can only be obtained through a partial sacrifice of fuel.

It may be inferred that the economical evaporative power of the boiler of the "Canute" is about 2½ times as great with good coal as it is with good coke; and that, though detailed and continuous experiments are wanting to complete the investigation of the question of coal-burning *versus* coke-burning engines, the conditions most favourable for the two classes of boilers are radically different. The coal-burner appears to require a large grate, and a large atmosphere in the fire-box; whereas it has been found by the author, after extended inquiry, that a coke-burner requires a moderate grate and a moderate atmosphere.

(*To be continued*)

LECTURES ON NAVAL ARCHITECTURE.

NAVAL architecture is a subject which has been frequently discussed in this Magazine, and one in which we feel great interest. It was, therefore, with pleasure that we recently received a "Syllabus of a Course of Lectures on Naval Architecture, to be delivered by Mr. J. Suffield," at the "Poplar and Blackwall Trade and Navigation School, held at Mr. Green's Sailor's Home, East India Road, Poplar." Our pleasure was, however, much abated on our glancing through the Syllabus, which is very curiously written—written apparently without the smallest attempt at scientific arrangement on the part of the writer. As one example we may state, that "Observations on Timber and its Preparation for Shipbuilding," come between "Chapman's Exponential and Parabolic Systems of Construction," and "Laying Off"; and, as another, we give the following extract: "Beams—Iron, applied to Shipbuilding—connection of Beam-ends to Ship's side." It must be remarked, however, that the lecturer, in practice, despised his Syllabus. On inquiry, we learned that Mr. Suffield was a young man filling some subordinate office in the firm of Messrs. Green, the eminent shipbuilders, and selected by those

gentlemen to discharge the duty of a public lecturer, upon one of the noblest, and at the same time one of the most intricate of the mechanical arts. The obscurity, so far as science is concerned, of the person thus put forward, compels us to transfer our criticisms from him to his employers; for if they were not chiefly responsible, such lectures as those under consideration have proved to be, would have no claim upon our attention, notwithstanding that the school in which they are delivered is announced to be "Under the Direction of the Board of Trade Department of Science and Art."

We attended the first and second of these lectures: the first, with such interest as the syllabus had not destroyed; the second, because the first contained nothing but a medley of historical statements, which the speaker had probably written with ease, but which he certainly read with difficulty. This first lecture was enriched with numerous allusions to ancient persons and places, with names that we had never heard of before, and shall doubtless never hear of again. At the conclusion of it the audience, who crowded the lecture-room, were informed that they would on the next lecture evening listen to something better than they had then heard, as the lecturer would then be aided and abetted by models and diagrams.

On the second evening, twenty minutes after the time publicly announced, the lecturer came forward and sarcastically (as we fancied) informed the audience (somewhat smaller than the former), that if they came there to listen to a discourse they would be much disappointed, for he came "to do the work" — a statement which caused us to peruse with anxiety the "Bill" announcing the lectures, which had been publicly and generally circulated, and further to wonder what "work" was about to be witnessed. Curiosity induced us to remain notwithstanding the ominous warning. The next remark of the speaker drew attention to certain models remarkable for varnish, and certain drawings not remarkable at all, which garnished the walls, and informed us that they were his own creations, and were suspended before us for the purpose of exhibiting the skill to which young naval architects might with study and perseverance attain, and of thus producing in the beholders that earnest application which is essential to eminent success.

Inspired in this way with scientific ardour, the audience were next instructed to draw a line (a portion of them having consented to be furnished gratuitously with *drawing instruments* and paper), and having *accomplished* this, to draw another,—the first along the paper, the second across it, the latter truly perpendicular to the former. Then commenced a series of arithmetical and geometrical performances in which "cosines" (which on this evening were points, occasionally), played a mysterious part, but which happily led to the production of a midship section of the most perfect character conceivable, if we may trust the testimony of the teacher. Then followed a rapid survey of the circumstances which were supposed to determine the shape of the ship in many parts, from which survey we learned that the form of the ship above the load water line was determined *primarily* by the inclination of the shrouds; although permission was certainly given to make her more or less full just above that line, according as you wished her, when inclined by the wind, to be "brought up" suddenly or slowly. The speaker was directing attention to the shining models before mentioned, in a manner which reflected great lustre upon the individual who smoothed and varnished them—and we are bound to say that he performed this duty with as much liberality as if he had been complimenting a very distinguished stranger —when we retired from the room, nearly an hour after the time announced for the conclusion of the lecture.

As life is too brief to admit of much amusement, we have been, and shall go, to no more of these lectures. We were not, however, merely amused on the evenings mentioned, but deeply pained at what we witnessed, as any man who is touched with an admiration and a love of science and art must be, when he sees the precious time, and the still more precious faculties of young men, wasted by frivolous, unsound and perplexing instruction. A glance around us showed clearly that there was a plenitude of ability, energy, and zeal in the students present, and an ample supply of materials to facilitate their studies. The only need was that of a teacher who both possessed and could impart to others a sound and clear knowledge of the art of ship construction. Without this the whole affair was what Mr. Carlyle might call a "solemn sham," made all the more offensive by the publicity given to it.

The young man who "lectured" deserves no reproach, so far as we know, except that which falls to every who has not modesty enough to limit his labour to its appropriate sphere. We say nothing, for we know nothing, of his ability as a workman, or even of his knowledge of his art; we simply state that whatever his talents may be, they are such as did not display themselves when he lectured an intelligent audience as above described.

But with Messrs. Green we must expostulate. As very successful and flourishing ship-builders, they are bound, for numberless reasons, to use their influence wisely, if they use it at all. We give them all honour for their spontaneous and very liberal efforts to improve the education and the comfort of their workpeople; but at the same time, we remind them that without exercising wisdom in the choice of instructors, they will labour in vain and expend their capital for naught. Give young men an able and efficient teacher, and you may put them in a shed, with nothing but a fragment of chalk and the floor on which they stand, and they will in six months learn more that is true and useful in naval architecture than a stumbling, inaccurate, inexperienced teacher will ever impart to them, though they should sit at polished desks, and handle the most costly instruments that art can furnish. There is not a country on the globe where the name of Messrs. Green is not known, and we hope that for the future they will remember their reputation, when they select a person to expound to the public the art by which they have won their fame.

THE LATE JAMES HANN.

This distinguished mathematician was born near Washington, in what is still known as the "Lane House," in the county of Durham, about the year 1799. We have heard him say that his father was the master smith at Washington Colliery, though how long he held that situation after the birth of his only son James we know not for certainty, but are inclined to believe that he shortly afterwards removed to Hebburn on the banks of the Tyne, where he superintended the old pumping-engine, his son performing the duties of stoker. Certain it is that, like most boys in this locality, at the period we are writing of, James was taken from school at a very early age, so that we imagine he could barely read and write when he began to work; and he continued in this state of ignorance for some years longer, manifesting none of that precocity which is usually recorded in the lives of great men. He became, probably from the circumstances in which he was placed, passionately fond of music, and devoted all his leisure hours in learning to play on the violin. Thus it was not until he had arrived at the age of maturity, and had taken to himself a wife, in his own station of life, that his mathematical genius began to develop itself. At that period, however, a working man had none of those advantages for study which are now offered by mechanics' institutes, philosophical societies, schools of art, and, more than all, cheap and useful text-books on the pure and physical sciences; but a genius like his was not to be deterred by what to others would have been insuperable difficulties. Whilst still working winding-engines for drawing coals at various places, he read all the works on mathematics which he could procure; but how difficult a matter it was for him to procure books will be best understood from the following anecdote, which he occasionally related to his friends:—

Whilst still an engineer in one of the small steam tugs which plied on the Tyne, he landed at the quay side of Newcastle, and in walking along came to the shop of a dealer in second-hand books. His eyes wandered rapidly over the collection, until they became fixed on a soiled copy of Dr. Gregory's "Mathematics for Practical Men," which was marked at a moderate price. But what did this signify, when he had not a penny in his pocket? He turned away in despair, and wandered homeward, thinking how he could become possessed of the treasure. On reaching home, he found that his wife was abroad in the fields, for it was harvest time, and his eldest daughter was performing the duties of housekeeper in her mother's absence. He inquired of the child if her mother had paid the rent which he had given her a few days before, and on being answered in the negative, he asked where she had put it. The daughter directed him to a teacup in the cupboard, where the father accordingly found it. He took the money and set off at once, as it was near the hour at which his wife was expected home, and he probably feared some remonstrance on taking it, if she were present. Meanwhile Mrs. Hann returned, and the first news from the daughter was that her father had taken the money from the cupboard. The wife set out in pursuit, and accidentally came up with her husband before arriving at the shop. She remonstrated, as he had anticipated, but he quieted her by saying, that if he could get that book, he believed he should "make all their fortunes." She at last consented that he might have it, and we have heard the poor fellow declare that the happiest moment in his life was when he became the owner of that work. It is rather singular that the author of it and Hann should in after years have become the most intimate of friends—so friendly, indeed, that the latter was entrusted by Dr. Gregory to superintend the publication of some of his unfinished works, in addition to educating his own son in mathematics.

As we have already said, Hann was much employed about the coal mines in Durham and Northumberland, where we still find him remembered for his pointed wit and good humour. We heard the following bon mot told of him by one of his early friends

—One night, when sitting in the engine-house at Hetton Colliery, where he was for some time employed as brakesman, one of the men went in, and pointing to the new moon, said, "Yonder is one-half of the moon, Jamie; where is the other?" Hann, nothing taken aback, replied at once, "Go and look in the adjoining pond, thou goose." Often, too, in later years, when we have been wandering along the streets of the metropolis with him, his wit has made us hold our sides with laughter.

But to return. Many of the best years of Hann's life were passed as a brakesman, until at length he was persuaded to open a school; and accordingly we find that he taught for a short time at Friar's Goose, near Newcastle. He began to write in the *Lady's Diary*, which was at that time, and still is, the only outlet in the country for the mathematical ability of self-taught men, and which has done more to foster a mathematical spirit in non-university men than any other periodical in the language. We find, on reference to this work, that he gained a prize in conjunction with Mr. W. S. B. Woolhouse, for having solved the prize question in the *Diary* for the year 1835, and we have often heard Hann remark how much gratified he was to have shared the prize with such a distinguished mathematician.

Three years prior to this he published, in conjunction with Mr. Isaac Dodds, "Mechanics for Practical Men," which met with a good sale. Possessing the friendship of Mr. Woolhouse, who is a native of Shields, and who, owing to his great mathematical genius, had obtained the appointment of first assistant in the *Nautical Almanac* office, that gentleman succeeded in obtaining for Hann a situation as calculator in the same office, where he remained for some time. At length both Hann and his patron retired, when the former became a candidate for the appointment of writing-master in Kings' College School, from which he rose to be mathematical master. Here he remained until within a year or two of his death, universally beloved by all his pupils, many of whom, after they left him, became highly distinguished at Cambridge. Notwithstanding the onerous duties he had to perform in the college, and the difficulties of a private kind with which he had to contend in his domestic life, he still found opportunities to write several useful treatises, among which may be mentioned those on the "Steam-engine," "Bridges," &c. Mr. Hann possessed a great mathematical genius, and was not only well read in all scientific subjects, but also in literature, and *his argumentative* powers could hardly have *been surpassed.*

This great man departed this life on the morning of Sunday, August 17th last, and was interred in Norwood Cemetery; being followed to the grave by his early associates, Messrs. Woolhouse and Baker, as well as a few more of his intimate friends, and the various members of his own family. It is the intention of a few of his admirers to erect a monument to his memory over the spot where his ashes repose, in order to testify their esteem for one who, amid many difficulties and troubles, was seldom or never known to murmur at his lot in life.—*Mining Journal.*

PATENT MARESFIELD GUNPOWDER.

This gunpowder, which is of perfectly novel introduction, is the result of a course of successful experiments made by a gentleman formerly connected with the Royal Gunpowder Works at Waltham Abbey. Why the discovery was not confined to those works; why the government did not secure the services, and with them the patent right of the inventor, and why the process is now in the hands of a public company, is no present business of ours, and the particulars would, if given, but tend to lead us into one of those controversies which have been unhappily too frequent of late, and which would only multiply charges against that truly English and singularly anomalous power—a British government. Suffice it, that it was at the Royal Mills the secret of the new powder was discovered, and that the results and advantages are now a "commercial fact." Hitherto the manufacture of gunpowder has been almost exclusively confined to two firms, unless we consider the government as another. It is equally strange that the three components—charcoal, sulphur, and saltpetre, are the same to-day as they were about the period that Roger Bacon existed. Nor does any change appear to have waited upon the present patent, the whole secret consisting apparently in the more intimate amalgamation of the ingredients. In the ordinary gunpowder, when let off, these three substances did not start fairly, one or other of the three being slower than the others, and consequently left behind. This want of rapidity in the one retarded likewise to a certain extent the other two; but in the present mode of admixture a fair and simultaneous start is made, and the three disappear with a greater detonation, little or no residue remaining upon the spot from which they take their departure. This gunpowder, in consequence of this attribute, is called "Electric," and truly deserves the title. One of the manufactories already at work is at Maresfield, Sussex, but the name it has

already acquired, although this mill is kept in constant action, has caused a demand for it for sporting purposes which cannot at present be fully supplied. This will, however, be soon rectified, as most extensive arrangements have been entered into to extend the plant, not only at Maresfield, but at the Plymouth and Dartmoor Gunpowder Companies Works, to fully meet the want. The latter Company will devote their energies to the production of gunpowder for blasting purposes, as the extra strength of this patent gunpowder, and the absence of smoke, has already induced the proprietors of important works in Wales, and in the west and north of England to enter into large contracts for its regular supply.

CURTIS'S APPARATUS FOR PREVENTING COLLISIONS BETWEEN RAILWAY TRAINS.

THIS apparatus consists in certain means whereby the guard of a train is enabled to attach a fog or exploding signal to the rail from the rear whilst the train is in motion. If the trains upon a railway were always to keep time, no accidents would be likely to happen; it is when one train has lost time, and is going slower than its usual speed, and another is following it at its proper or an advanced rate, that accidents from collisions take place. To meet this case, Curtis's apparatus is contrived. If a train from any cause whatever has lost time, and there exists a fear that a following train may run into it, the guard, by turning a handle, as in the act of ringing a bell, causes a fog signal to be placed upon the wheel of the van which runs over it, without exploding it, and by the weight of the wheel the signal becomes fixed immovably to the metal, and the engine of the following train, exploding it, the driver is thereby warned of danger a-head. One or more may be so deposited, thus advising the engine-driver, by the number of detonations, of the degree of danger, and the amount of caution required to avoid it.

This apparatus has been applied to carriages on the Great Northern, the South-Western, and the Brighton railways with complete success. The expense of the apparatus is very trifling, as it consists merely of a flat iron bar pointing towards the wheel, covered with a thin sheet-iron case, protecting the signals from the splash of the wheel and from the weather. A cord passes from this bar to the interior of the guard-van like a bell-wire; and when occasion requires, the guard, by turning a handle, causes the signal, as before observed, to pass under the wheel.

The apparatus requires no particular care. It may not be used for months, and is notwithstanding ready for use at any moment, and the signals cost but sixpence each. Thus a most simple means is now provided whereby our trains may communicate with each other, and thus collisions from swift trains overtaking slow ones be with certainty avoided. Great therefore will be the responsibilities of railway authorities if they fail to avail themselves of this simple, efficient, and economic contrivance. The invention is due to Mr. W. J. Curtis, of Sebbon-street, Islington, who is likewise the original inventor of the fog signal, distance telegraph, and other railway improvements now in use almost throughout the world.

HAND'S PATENT ECONOMIC KILNS.

AN economic kiln has been for some twelve months past in constant work at Epsom under the management of Mr. Hands, the patentee, who has by its means dried and burned almost every description of bricks, tiles and potter's ware. The kiln itself presents but little outwardly to attract notice, with the exception, that when at work not a particle of smoke is seen to escape from it, nor is there the slightest evidence of those peculiar odours, which are not only present in the neighbourhood of brick fields, but make themselves "felt and smelt" for some mile or two to leeward. The whole of the smoke is conducted downwards through a shaft, which goes first under ground, arises again, and enters a drying room, travelling around it like an inner and independent hollow wall. Shortly after the fires are lit in the kiln, the temperature of the drying rooms rises rapidly to some 130°. While we were present, the temperature was 110°; but this was upon the second day, and the fire had been put out of course some hours. In this apartment had been placed 30,000 green bricks, carried directly from the hands of the maker, and it should be mentioned that the roof of the building was of a very temporary description, and far from adapted to keep either the cold air out (and it was freezing externally) or the hot air in. After passing through these chambers for drying the moist clay articles, the gases and hot air travel along a raised and horizontal shaft back again to the kiln, where tongues of flame which are permitted to escape into orifices meet them, and most effectually prevent the effusion of smoke.

Now if we are correct in surmising that hundreds of yards of drying rooms may be as readily warmed as the seventy we are alluding to, we have here a mode by which most of the perpendicular shafts in England,

or elsewhere, may be thrown down, and not only made to do their work upon *terra firma*, but in doing so become important auxiliaries in various ways, while the smoke is entirely got rid of. We shall have occasion to return to the subject very shortly, as an immense stack of buildings is in the course of erection in Surrey, where the principle is about to be carried out in all its details, for various drying purposes, and where, of course, its capability may be fully and conclusively tested.

The patent being one of very great importance, more particularly at this period, we have called our readers' attention to it, and we feel assured Mr. Hands will be as ready to enter into any necessary detail to those who may desire it, as he has been to extend his courtesy to us, who have thought it but fit that we should personally pay the temporary works at Epsom a visit. It should be added, that in the new works spoken of as in course of erection, a temperature of at least 200° is expected as the result of one "burning off," and that the equable character of the heat throughout the apartment is one of the chief features of the process.

AMERICAN WAR STEAMERS.

A correspondent of the *Journal of the Franklin Institute* says: "I wish to draw the attention of the 'powers that be,' to an useless incumbrance placed on our vessels of war, particularly those propelled by steam. As this retarding force is to be seen on all of the old vessels, it may almost be considered one of the cherished 'institutions' of the navy, yet I, for one, think that *progress* should have ere now reformed this; but not so, for the *Wabash* is thus disfigured; and as the *Minnesota* has pump pipes outside, she no doubt will have the same incumbrance after being coppered. At the time of building the former vessel, I noticed that the workmen were very particular in smoothing the planking of the bottom, and also that great attention was paid to the coppering, setting it up close to the planking. So far the beautiful formed lines of the naval constructor remained perfect; but next comes *four* large lead pipes, one at each quarter and main chains, and over these more copper was put, projecting about three inches from the plane of the sides, altogether making over *seven and a half square feet of retarding surface under water*. I will leave to the mathematicians of the Navy to estimate how many *barnacles* studded over the bottom would be equal to *the pipes*, and how much coal will be *required to be* carried on a voyage to overcome this worse than useless arrangement, which is an injustice to the naval constructor and the builders of the machinery, who are conjointly responsible for the speed of the ship."

THEORY OF THUNDER STORMS.

The first indication of a thunder storm is a heated, sultry, and very oppressive atmosphere. We usually see clouds, and groups of clouds, with strongly and distinctly marked outlines; and not unfrequently—particularly in mountainous districts—considerable disturbances are seen amongst the particles of vapour composing such clouds, the particles about the circumference moving towards the centre, and those about the centre moving towards the circumference. This we shall see by-and-by is owing to the positive and negative electricity of the cloud; the centre being positively, and the circumference negatively electrified, although the whole cloud may be positively electrified with regard to another neighbouring smaller cloud.

I hope to show pretty clearly, when I come to treat of the lightning flash, that this positive and negative electricity is one and the same kind of matter in different states of power or saturation, and not two different kinds of fluid, as some suppose; and that electricity is nothing more or less than caloric disengaged from the internal pores of matter. If we could *suddenly disengage* caloric from matter, we should have the lightning flash, and the disintegration or decomposition of such matter would ensue, and it begin to assume new combinations. I will mention the firing of gunpowder as an elucidation. Here the latent caloric, when the disruption or explosion takes place, assumes the electrical or free state. To give an instance, I recollect reading an account of an explosion of a pyrotechnic establishment in London, about twelve or fourteen years ago, when a person was passing with a knife or knives in his hand, and although he escaped unhurt, it was stated as something wonderful, that some mysterious power suddenly wrenched the blades of the knives from their handles. The heat of an ordinary fire is undoubtedly not—as some chemists define it—free caloric, but partly free (electrical) and partly combined with matter, namely, atmospheric air.

It will be necessary to bear in mind, that the greater the *difference of temperature* between two neighbouring thunder clouds, the greater will be the inductive power of caloric

to disengage itself, and manifest itself electrically. The larger and more dense cloud of a higher temperature being positively electrified, and the smaller and less dense cloud of a lower temperature being negatively electrified—bearing in mind that the atmosphere is a bad conductor of electricity—the mutual attraction between them will increase, as the square of the distance decreases. The inertia of the large mass of vapour composing two such clouds is so great, that they can be put into motion towards one another but very slowly. When however, they approach so near each other that the power of attraction between the positive and negative clouds becomes so great as to cause a transference—to gain an equilibrium—of the caloric of the positive cloud into the negative one, we have the electric lightning flash. Here it is necessary to note that the centre of the cloud, which was *hottest* before the discharge, has now become the *coldest* part: *the abstraction of the caloric having suddenly left the watery vapour in a frozen state. Now to gain an equilibrium of heat or temperature between the centre and circumference of the cloud, the great difference of temperature powerfully induces the caloric of the vapour to assume its electrical functions, and causes the frozen particles about the centre (negatively electrified) to rush towards the frozen particles of the circumference (positively electrified) and these towards the central particles, thus forming hail stones; and in a similar manner drops of rain and snow flakes.* It is thus easy to see that the particles being thus formed into close compact, the *free caloric* (electricity) surrounding each molecule before its formation into hail stones and drops of rain, will be forced towards the circumference of such hail-stones and drops of rain, and that, consequently electricity will be very sensible during the fall of hail and rain. Snow flakes are formed more sluggishly than the former, and therefore, I presume, electricity does not manifest itself nearly so sensibly. Mists, fogs, clouds, and steam when it begins to condense, upon the same principle manifest free caloric (electricity.) It is thus easy to conclude that evaporation is owing to difference of temperature, which induces caloric to become free (electrical), and the atmosphere being a non-conducting medium, each molecule necessarily becomes clothed with an atmosphere of free caloric (electricity), and both combined cause a molecule of water, with its imponderable electrical atmosphere, to be lighter than atmospheric air, and therefore to rise into the upper regions of the atmosphere. This subject will however become more plain when I come to treat of other phenomena.

Although positive and negative free caloric (electricity) have a powerful tendency to form matter into globular shapes, the globular shape may be formed on another principle, namely, pressure from without. For instance, if a small quantity of water be placed in a red hot iron or other oxidisable metallic ladle, the water assumes the globular form simply from the fact that the oxygen of the water combines with the metal, and the hydrogen being set free, in forcing its way upwards by the surface of the water, necessarily gives it the globular shape. The large globules of water frequently seen on cabbage leaves are similarly formed. I heard a popular lecturer explaining to a large audience that the principle which causes this globularity, gives to the earth and the planets their globular form; that this is not so, I shall probably show in some other letter, when I come to treat on the cause of the gravitating principle of the solar system.

The investigation into the cause of the potatoe blight, which I commenced about the latter end of 1845, and which I pursued thenceforward to about May, 1848—as near as I can recollect—led me to the above theory of thunder storms, by long, pleasurable, and patient contemplation of natural phenomena. It opened so simple and beautiful a view into the economy of nature, that I can hardly describe the secret and enduring pleasure I derived from the investigation of it. I was at the time a lieutenant of Revenue Police, stationed in a secluded and mountainous district, Plumb Bridge, near Gortin, in the county Tyrone. I lodged at a farm house on the side of a mountain, near half a mile from the barracks; and notwithstanding this isolated position from society, I look upon it as the happiest period of my life.

I may show, in some future letter, the connection with vegetable blights that thunder storms have, before the lightning flash and the descent of rain takes place. I may also show that the very power which forms a hail-stone, or drop of rain, is sufficient to form a world, and preserve the earth a sphere. I do not pretend to tell the *nature* of this power—caloric in its different states; all that I shall attempt to do will be to show its functions in some of the phenomena of nature; when the above theory will (I cannot doubt) appear more plain, and much more simple and beautiful to those who may feel disposed to give it a careful and unprejudiced investigation.

Thunder storms will necessarily produce a considerable galvanic action upon telegraphic wires in the neighbourhood of them; and when the *difference* of temperature is very considerable between short distances, electric discharges will be induced, and

consequently showers of hail, &c. They also, *before the electric discharge*, stop, or greatly check the growth of vegetables, as evinced by the lax and flabby appearance of the leaves of cabbages, potatoes, and other vegetables, simply because the atmosphere and the ground are brought into the same (positive) electrical state; whereas for the effectual and rapid growth of vegetables, the surface of the ground, with heat derived from the rays of the sun, should be positively, and the atmosphere in contact with it, negatively electrified. I may, however, elucidate this subject more hereafter.

WM. STEEVENSON.

FACTS AND FANCIES.

To the Editor of the Mechanics' Magazine.

SIR,—Believing that motion can be destroyed without anything destroying it, I am a disciple of Mr. Evan Hopkins. Also believing that the moon does not rotate on her axis, I am a disciple of Mr. Jelinger Symons. Being also very anxious to proceed in the path I have chalked out for myself, I am desirous of becoming a disciple of Mr. J. Pitter; but I do not like to declare myself until a little more qualified. If Mr. Pitter will only give me a little stock in trade to set up with (a very little will suffice), I shall feel grateful. On the threshold of the temple of Pitterian philosophy I find the following: "A fact is always valuable, and a theory is of little good until it merges into a fact." A few steps further and I stumble upon "The gas which is emitted from stagnant pools, and ignites spontaneously, is looked upon as a lamp carried in the hands of a malicious spirit, seeking to allure the benighted traveller into some dangerous swamps." This gas knocks all the wind out of me by what the *Times* would call a "liquid blow." Will my master, that is to be, inform me what experiments and observations this theory—no, not theory, we are to have none in our philosophy, this —— is founded upon? What is the nature of the gas? Can it be ignited otherwise than spontaneously? Has any one carrying a lantern ever ignited it? If so was he hurt, blown upwards, downwards, singed, or only comfortably warmed? What is the temperature at which it ignites? How much atmospheric air is mixed with it at the time of ignition? Does it explode and make a noise? What are the products of combustion? And a few other interesting "facts" connected with this strange ——, what is to be the word, Mr. Pitter? Another word, too, you must help me to. I am to use the word "approach" instead of the word "attract." Must it be "approachtion" instead of "attraction?" We must have a noun as well as a verb. I hope this is not dictating, which would be very unseemly in a pupil. As I am in future to say the iron "approaches the magnet," and not "the magnet attracts the iron," am I to consider that this power of approachtion exists in the iron? because these would-be philosophers who only see science by the light of bog gas spontaneously ignited, seem to think that the attraction belongs to the magnet. I tie a string to a piece of iron, and let a weight, at the other end of the string, hang over the edge of the table, and find that the weight draws the iron along; but if I place a magnet in a certain position on the table, the weight will not move the iron; it, and the magnet too, remain stationary. If a bystander asks me why the iron no longer moves, am I to say it is because it approaches the magnet? I trust my luminary will enlighten me on these points, or I shall find it awkward work being his

DISCIPLE.

BESSEMER AND MARTIEN.

To the Editor of the Mechanics' Magazine.

SIR,—Mr. David Mushet is so accustomed to misrepresentation whenever he has the worst of an argument—which appears to be his fate in all discussions—that your readers must ere this have formed a tolerable opinion of his lucubrations. His reply in your last is a good specimen of his style, as well as of his plan of resorting to personal abuse when his small stock of arguments have been worked up. He is at no trouble to rebut the charges brought against him in connection with his attempt to mislead the public on the Bessemer *v.* Martien affair, but merely pleads ignorance—a plea which cannot be allowed with the knowledge that Mr. Avery published the existence and nature of Mr. Martien's claims some weeks previously.

Mr. Mushet kindly forgets that it was Mr. Noad who attacked me about a year ago, and having fired a feeble broadside of abuse, retreated without further ceremony. The "severe castigation" fell on Mr. Noad, who hastily retired, with a thrice-repeated assurance that he would not again attack me on matters pertaining to the manufacture of iron.

The attempt to place me in error in respect to the date of the "new version," is such as only Mr. Mushet would make. It is scarcely necessary for me to say that there is not a word of truth in his statement that it was dated the 8th and appeared on the 13th September. It bears date September

18th, and appeared on the 20th of the same month.

The most serious misrepresentation in his letter is that wherein he impeaches the memory of two men, both dead these several years. He charges Sir John Guest and his manager, Mr. Thomas Evans, with patenting an invention communicated to them in confidence by Mr. Leighton. There is an utter absence of truth in this charge.

Mr. Leighton's plan was to throw steam into the chamber of the furnace, and cause the puddling to be done in an atmosphere of steam. It was tried in 1838, and failed, as was predicted at the time. The absurdity of the idea of having the furnace full of steam, and yet maintained at the white-hot temperature necessary for puddling, was equalled only by a previous discovery of this gentleman—that forge-cinders were composed principally of carbon! The conveying the steam *into* the molten iron formed the subject matter of Guest and Evans's patent of 1840, as a reference to your columns will show. That Mr. Leighton himself considered it in this light is very evident from his avowal, in a published letter, that though all along aware of Guest and Evans's patent, it was not until eleven years after perusing an abstract of their claims, and thirteen years after his abortive experiment, that he mentioned his own connexion with steam in puddling.

Mr. Leighton's letter, I may remark, is followed in the same column by one of Mr. D. Mushet, the self-styled "inventor's friend." Then, however, he could not see that Mr. Leighton had the least claim to the invention — probably because Sir J. Guest was still alive. Now both patentees are dead, and Mr. Mushet attempts to deprive them of merit which he dared not have questioned while they were alive.

Mr. Mushet's character will be seen to still greater disadvantage when I mention that, in the year preceding Mr. Leighton's experiments at Dowlais, the baronet afforded Mr. Mushet's late father every facility for testing the value of his patented inventions in iron manufacturing, gratuitously, and specimens of the iron so prepared by him at Dowlais were subsequently exhibited at the meeting of the British Association and other places. The idea of paying back obligations by slandering the dead belongs to Mr. Mushet, and he will long remain its undisputed possessor.

I am, Sir, yours, &c.,

WM. TRURAN.

Marazion, Nov. 24, 1856.

To the Editor of the Mechanics' Magazine.

SIR,—It seems that the only plea Mr. Mushet can adduce in extenuation of his mysterious change of opinion on the new mode of manufacturing malleable iron and steel without fuel is that of *ignorance*. This is unfortunate for him, the more so as he prides himself so much upon the weight and value of his opinions on matters relating to metallurgy, the mere expression of which he considers sufficient to crown with success or to annihilate an invention. He attempts to shield himself and to divert attention from the main points in dispute by such silly expressions as "I could not know," "not dreaming," and such like. Now that Mr. Mushet has not yet met the charges made in my letter of October 18th, must be clear to every unprejudiced mind. If he did not *know* what he was writing about he should at once admit the fact, and there would be an end of the matter. If he did not *understand* the nature of Mr. Martien's invention or operations, whichever he choses to term them, it was his own fault and not mine. As I before asserted, Mr. Avery distinctly stated the nature of the invention which he claimed for his client Mr. Martien. He stated that he considered the value of the process "almost illimitable," and then described the peculiar character of the new process of treating iron to which he referred, namely, *the subjecting it to the direct agency of and disseminating through and amongst it atmospheric air under pressure as it flows from or after it has flowed from a blast furnace and prior to congelation.*" I express now no opinion as to the validity of Mr. Avery's claims; but it was in reply to this clear and intelligible statement that Mr. Mushet said he had "no faith" in the operations of Martien, and that he could "feel no delicacy now in discouraging what is entirely annihilated" by what, in the former part of the paragraph, he terms "Mr. Bessemer's most novel and overwhelming invention." Now, if after the reading of these facts, Mr. Mushet can still assert that he meant the "Renton process," or if he has still the effrontery to justify his aspersions on my veracity, the least he can do is to oblige me with a "key" to his mysterious vocabulary.

But with his peculiar knack of catching at a straw, Mr. Mushet makes an effort to divert attention from his own ridiculous position by arraigning me before the bar of public opinion on the very serious charge of calling Martien's experimental *operations* an *invention*. Here I at once plead guilty, and hope that Mr. Mushet will follow the example, and plead guilty to the many and

more serious charges at present laid against him. I am at a loss, however, to see in what way the *mistake* on my part alters or impairs his own position.

I am, Sir, yours, &c.,

WILLIAM GREEN.

November 22, 1856.

FLYING BY MAN.

SIR,—Your correspondent "A Dubious Reader," has addressed to you in the Number of Nov. 15, the following remarks relative to the above subject, broached by me in a former issue (No. 1721, p. 111) of the *Mechanics' Magazine*.

"Your worthy correspondent, Dr. Lotsky, sometime since gave us a few hints concerning an apparatus which he seems to have in his mind; but as he did not go into detail, or give us the slightest sketch of the invention, I fail to think that his letters on the subject were of much use."

To this I have to reply, that the "*use*" I intended by my broaching this subject, was just *that* of eliciting *echoes*, as it were, like that of a "Dubious Reader."—Amongst the many anomalies of our present state of social *transition*, the enactments of the patent laws (here and abroad) are none of the best, *because* a "Dubious Reader" ought to have been aware, that there is (I think) a *little* clause in that law here, saying, that nothing that has been *published*, can be patented (afterwards). The interpretation which I, in my blunt way, put on this clause is, that *because*, say a Humphrey Davy, has studied for years the subject of the safety lamp and published papers on the subject, he will be precluded from taking out a patent thereon.—If it were permitted to *legislate* in the columns of the *Mechanics' Magazine*, I would change that clause thus: "No person can take out a patent for a subject which has been published by any one else, except by consent of this person, his heirs and executors; or ten years after such publication," etc. Still, the patent law business will never be properly conducted, until a committee of lawyers and scientific men, sitting with open doors, will take the affair into their hands. But, of course, if patent fees also are to be a mere source of financial revenue, every word said is time and labour *lost!*

These are the reasons why I have been chary to give "the slightest sketch of this invention," as "A Dubious Reader" reproaches me with. Still, the thing is ready, like Columbus's map of the world; but we want families like the *Pinzons*, not to ruin (Cort-like) but to assist inventors. But, the Crystal (the People's) Palace will have *to accomplish* sooner or later its great *destiny*, namely, to exhibit to England, Europe, and the world everything of a novel and grand character. I think that *the Flying by man*, accomplished even in the most rudimentary and humble way, would attract millions of visitors within the precincts of that majestic place. But great inventions require great patrons.

We want a hero—an uncommon one!

I am, Sir, yours, with esteem,

JOHN LOTSKY.

15, Gower-street, London.

To the Editor of the Mechanics' Magazine.

SIR,—There can be no doubt in the minds of practical men, that by means of a judiciously constructed apparatus on the principle of the "aërial top," a man may elevate, and for a short time support himself in the air, as proposed by "A Dubious Reader," at page 469 of your last Number. But such an apparatus, like its immediate prototype, would be nothing more than a philosophical toy, wholly devoid of usefulness, for the following, among many reasons. In the first place, the rotation of the vanes will, after a short time, be inevitably communicated to the whole of the apparatus, and to the aspiring individual, causing giddiness, loss of reason, and a fall from his high estate. Secondly, elevation being obtained, the apparatus would be at the mercy of the winds, the traveller being perfectly powerless in the matter of control.

Many years attention to all the facts appertaining to this branch of science, has convinced me that "flying by man"—that is, by muscular efforts, is an utter impossibility. But that flotation, that is, support, being obtained by means of any agent hydrostatically lighter than atmospheric air, it is possible by muscular power, judiciously applied, to navigate (within certain limits) the open firmament of heaven as easily as the pathless ocean. The difference *in extent* being exactly equal to the difference between the density of atmospheric air and water, and no more!

Want of means on the part of the inventor, and of willingness on the part of those possessing the means, alone prevents, or at least delays, the demonstration of this grand problem, and keeps the noble science of aërostation in the swaddling clothes in which it has now for three quarters of a century been enveloped.

I remain, Sir, yours, &c.

WM. BADDELEY.

13, Angell-terrace, Islington,
Nov. 18, 1856.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

COTTAM, G. H., and H. R. *Improvements in the manufacture of chairs, bedsteads, and other articles to sit and recline on.* Dated Mar. 25, 1856. (No. 708).

This invention consists in a method of constructing folding chairs, in order that they may fold more completely and conveniently than chairs heretofore constructed. Also, in casting ornaments of zinc, or other metal melting at a lower temperature than brass, on to parts of the frames of metal bedsteads, chairs, &c., and afterwards depositing brass or other metals on to such ornaments by the electrotype process. And lastly, it consists in casting a shell of metal round a bar or tube of iron, to form the leg of a bedstead, chair, or other article.

HARGREAVES, J. *Improvements in the apparatus used for dyeing fabrics.* Dated Mar. 25, 1856. (No. 709.)

These improvements consist of a combination of mechanical parts, so that several such frames may be mounted on and revolve with axes, when placed in the dye-liquor.

BALL, W. *Improvements in machinery for stamping ores.* Dated Mar. 25, 1856. (No. 711.)

In this invention the stamper consists of a very heavy metallic bar or rod, which is made to play up and down vertically in bearings, and through the eye of a bevel gear, from which projections extend into a long groove made in the stamper, so as to cause the stamper not only to revolve with the bevel gear, but to be able to rise or fall independently of it. This bevel gear is rotated by means of a bevel-pinion fixed on the shaft of a pulley turned by a band proceeding from any driving source.

COLLINS, R. *An improved agricultural implement.* Dated Mar. 25, 1856. (No. 712.)

This invention consists in certain mechanical arrangements, designed for adapting one machine to four distinct uses —namely, as a "scarifier," a "couch-rake," a "skim plough," and a "turnip hoe." The patentee so constructs a light iron frame-work that the sides are capable of being adjusted nearer together or further apart; as also land wheels and shafts, according to the purpose for which he requires the machine. In like manner he adapts thereto suitable implements of the ordinary kind.

TOLHAUSEN, A. *A new process of producing chemical writing, and of marking and inscribing chemically any characters or figures upon paper or other substance of similar character.* (A communication.) Dated Mar. 26, 1856. (No. 717.)

To prepare the paper, the patentee saturates the common sizing used for writing paper, with salts, or substances of considerable solubility, and which, when dried with the paper, will maintain dryness under ordinary atmospheric changes. He now takes a deliquescent salt,—for cheapness a ferric oxide, as the nitrate, chloride, or sulphate of iron,—and triturates and mixes it intimately with plastic clay. He then moulds the ferric clay to constitute a pencil, bakes it, and plunges it into molten bees' wax or spermaceti, to form an air-tight coating. The prepared paper is now written upon with the pencil, and the ferric salt in the pencil, during the act of writing, absorbs moisture, comes in contact with the salt in the paper, and the two unite chemically, thereby producing coloured writing.

TOLHAUSEN, A. *An improved mode of manufacturing porous earthenware.* (A communication.) Dated Mar. 26, 1856. (No. 718.)

This invention consists in the use of a volatile salt or substance, mixed with the substance which is to form the porous ware; the volatile salt, or substance, is driven off in the baking thereby leaving the material porous.

GILBEE, W. A. *Improvements in the manufacture of glass.* (A communication.) Dated Mar. 26, 1856. (No. 719.)

This invention relates to improvements upon a patent obtained by the patentee, 4th Sept., 1855, and consists in certain new arrangements of apparatus for employing the heat and gas of coke ovens in the manufacture of glass.

DAFT, T. B. *Improvements in the manufacture of metallic and other bedsteads and articles of metallic and other furniture.* Dated Mar. 26, 1856. (No. 720.)

This invention relates—1. To a mode of connecting metallic bedsteads and other articles of furniture at the corners of the frame. The patentee forms a spigot and faucet joint to the legs and corners of the frame, and gives to the spigot and faucet such an inclination as shall make them firmly unite when simply put together and driven home. 2. To a method of ornamenting the legs or pillars of furniture when of cast iron, by placing them in a mould and casting upon them brass, copper, or other metal. 3. To a method of fixing the castors to the legs of metallic bedsteads and other articles of furniture. A screw is used, which passes up from the castor to a metal washer (supported by suitable projections formed on the interior of the leg) where it is secured by a nut. 4. To tipping the ends of the legs of iron furniture with brass or other metal. The tip is fastened to the leg by means of a tubular shank formed on

the tip; this shank enters a hole in the bottom of the leg, and is turned over or riveted on the inside. 5. To a method of rendering metallic laths elastic, so as to enable them to pass over the buttons on the frame when the same is made in one piece.

LOWE, D. *Improvements in knitting machinery.* Dated Mar. 26, 1856. (No. 721.)

This invention comprises an arrangement of machinery in which the needle bar is arranged to move from and to the front of the machine, and which cannot be clearly described without engravings; also, an improvement upon a former patent of the present patentee's for making tuck work or for narrowing.

ROCK, J., jun. *Improvements in carriages, parts of which are applicable to other structures.* Dated Mar. 26, 1856. (No. 725.)

This invention consists—1. In the construction of certain folding or collapsing heads or coverings for carriages or waggons, intended to be either permanently attached or moveable, and constructed either of two or more solid panels, hinged or jointed together to form folding ends and sides; or of panels consisting of a number of strips or pieces jointed or hinged to one another, or connected together like Venetian blinds; or of a frame or frames of metal, wood, or plastic material, or other suitable substance; or of jointed rods filled in or not with thin panelling, or with thin metal or glass, or covered or not with leather, canvass, baize, or other flexible or textile material or with India-rubber, or other suitable substances. Or the patentee sometimes forms the heads or coverings of folding panels, made after the fashion of a book-cover or portfolio, with parts thereof flexible, to serve in lieu of, or in aid of hinges. In some cases when he employs wood panels to obviate the inconveniences arising from the shrinking of the wood, he joints together edgewise a number of pieces, and secures them together by screwed or keyed bolts, which may be tightened as the wood shrinks. The invention consists — 2. In constructing waggons, ships, huts, &c., of panelling formed in the various modes above described, as applicable to the heads of carriages.

NEWTON, W. E. *Improved apparatus for exploring under water.* (A communication.) Dated Mar. 26, 1856. (No. 726.)

The patentee describes a submarine boat, or air vessel, fitted with propellers, rudders, lights, ventilating apparatus, &c.

CLAYTON, W. *An improved manufacture of soap.* Dated Mar. 26, 1856. (No. 727.)

The chief object is so to modify the character of toilet soap as to render it an emollient of the skin. The patentee proposes to *add to* soap made in the ordinary manner, bees' wax or vegetable wax, in the proportion of from one to two parts by weight for every sixteen parts of soap.

NEWTON, W. E. *Improvements in macerating substances to be employed in the process of distillation.* (A communication.) Dated Mar. 26, 1856. (No. 728.)

This invention consists in diluting the meal of maize, dary, rice, fecula of potatoes, or any other fecula, in a vessel heated by steam, so as to give the diluted mass of meal a temperature of 176° Fahr., taking care that it is not clotted, and without adding boiling water, in order to avoid incrusting the sides of the vessel.

TOLHAUSEN, A. *Certain improvements in watches and other time-keepers.* (A communication.) Dated Mar. 27, 1856. (No. 730.)

This invention consists—1. In an escapement which is uninfluenced by shaking the watch. 2. In a novel device for compensating for the tendency to variation of the balance consequent upon changes of temperature. 3. In certain arrangements of the barrel fusee, main spring, and chain, for reducing the friction on the fusee pivots, and equalizing the friction on the barrel. The details require engravings to illustrate them.

TALL, J. *Improvements in blind-rollers, and in fixings for the same.* Dated Mar. 27, 1856. (No. 731.)

This invention relates—1. To the construction of blind rollers for windows, &c., so that they may be readily adjusted to any ordinary window, and consists in giving to such rollers a telescopic action by which they may be extended or contracted within certain limits to any required width. A metallic tube, having a slot throughout its length, is furnished with a core roller of wood in two lengths, the tube also being in two parts for drawing out; one end of the blind is inserted edgewise through the slit in the tube, and retained by a rod within the top of the blind of a thickness greater than the slit. A pulley at either end is fitted to the roller. 2. To an improved bracket or fixing for securing blind-rollers to the framework or beadings of window-frames in place of the common bracket, and consists of small cramp irons attached at pleasure by thumb-screws.

CUMMING, R. D. *A footstool and hassock combined.* (A communication.) Dated Mar. 27, 1856. (No. 733.)

This invention consists in forming a hassock and footstool combined, in such manner that when not required as a hassock, it may be used as a footstool, and *vice versâ.*

BRUNEL, B. F. *Improvements in the manufacture of Prussian blue.* Dated Mar. 27, 1856. (No. 734.)

This invention consists in adding to the ingredients usually employed in the manufacture of Prussian blue, chromic acid, and oxalic acid, in mixing the whole together in a precipitating vessel, and in the application thereto of a current of electricity.

BALL, W. *Improvements in machines for separating copper and other metals from their ores.* Dated Mar. 27, 1856. (No. 736.)

The patentee describes certain machines by which the process of washing pulverized ores by hand is imitated. The invention mainly consists in permitting the water to flow from the trough at two different levels, each of them above that to which the metallic particles are allowed to settle, whereby a head of water is maintained entirely above the ore, which is thus kept loosened and suspended as required.

HILL, A. L. *Improvements in furnaces for steam boilers, japanners' stoves, and other such like purposes.* Dated Mar. 27, 1856. (No. 737.)

This invention consists of arrangements of parts which cannot be described without illustrations.

THOMAS, W. F. *Improvements in sewing-machines.* Dated Mar. 27, 1856. (No. 740.)

This invention is for keeping the shuttle thread in proper tension, which is done by means of the end of a lever or instrument pressing on the thread against the side of the shuttle, which pressure is relieved by a cam or projection at the proper time, by which the thread at one time is pressed and held against the shuttle or proper surface, and at other times is relieved from that pressure, &c. Another part of the invention relates to sewing tubular work, such as the fingers and other parts of gloves, so that the article may be able to slide on to the narrow table through which the needle works, and under which the shuttle or apparatus which introduces the second thread is worked.

BARRATT, J. A. *A new rotatory steam-engine.* Dated Mar. 28, 1856. (No. 741.)

This engine cannot well be described without engravings.

WARD, W. *Improvements in apparatus for lubricating the spindles of certain machines, and in preparing and spinning.* Dated Mar. 28, 1856. (No. 743.)

This invention, which is applicable to machines in which a lifting rail is employed, consists in attaching to the lifting rail or other convenient part of the machine a trough containing the lubricating material, which is applied to the spindles periodically by a vibrating or rotating shaft furnished with suitable projections.

DANIEL, A. *Improvements in the manufacture of keys and locks.* Dated Mar. 28, 1856. (No. 744.)

This invention consists in casting keys with the wards in, by laying into the moulds chills or cores of the size and shape necessary to form the wards, by which means the process of cutting the wards is avoided; and in the application of a new mode in the construction of the casting patterns used in casting mortice, rim, or other locks, by having a series or set of wards differing from each other, and the patterns used for casting the lock cases so constructed that these wards can be taken out and exchanged at pleasure, which obviates the necessity of having to use a separate pattern lock case for each of the wards.

WEBBER, J. *Improvements in generating steam.* Dated Mar. 28, 1856. (No. 745.)

This invention was described and illustrated at page 314 of No. 1730.

CHARRITIE, J., and W. SMITH. *Improvements in the manufacture of small shot.* (A communication.) Dated Mar. 28, 1856. (No. 746.)

This invention will be described in an early Number.

HARRISON, J. *Producing cold by the evaporation of volatile liquids in vacuo, the condensation of their vapours by pressure, and the continued re-evaporation and recondensation of the same materials.* Dated Mar. 28, 1856. (No. 747.)

Claim.—The use of volatile liquids (including water) evaporated in vacuo, and reduced to the liquid form in separate vessels by pressure, for production of cold, and in the manufacture of ice, and generally in all processes where refrigeration is requisite or desirable.

GETLEY, S. *Improvements in supplying and drawing water to and from cisterns.* Dated Mar. 28, 1856. (No. 748.)

In this invention a combination of apparatus is employed, whereby the supply pipe to the cistern is used for drawing off water from the cistern. The supply pipe leading from the main has a valve opening with the pressure of water from the main to the cistern; hence the water will flow to the cistern so long as it is not filled. There is another valve near the bottom of the cistern which is connected to a float, the action of which is limited by spindles moving in guides, or a small piece of chain at the top of the float fastened to the side of the cistern, and therefore this valve is at all times open when the float is not at its highest position. The water is conveyed in any direction from the supply pipe by pipes connected intermediate of the two valves.

HARRISON, J. *Distilling or evaporating in vacuo, and condensing the vapour by pressure, and economising heat.* Dated Mar. 28, 1856. (No. 749.)

This invention consists in carrying on the process of distillation or evaporation, by

withdrawing the vapours formed in one vessel, and compressing such vapours with a force sufficient to liquify them in another vessel, or in another chamber of the same vessel, so that the heat given out by compression shall be available for a continued supply of vapours from the first vessel or chamber, the whole process being conducted at any required temperature in vacuo, that is to say, the liquid and vapour being cut off from the pressure of the atmosphere.

TRUEMAN, A. *Improvements in treating argentiferous regulus.* Dated Mar. 28, 1856. (No. 750.)

The regulus is roasted to convert the metals into the state of oxides, which are then acted on by acid, preferring sulphuric acid, with a quantity of common salt or other chloride, or hydrochloric acid, according to the ascertained amount of silver present. By such means the copper will be dissolved, and the silver rendered insoluble to the acid. The copper may then be precipitated by iron, or otherwise separated, and the silver may be obtained from the residue by ordinary means. The chloride or hydrochloric acid may be employed when roasting the regulus.

WILLIAMS, C. W. *Improvements in the application of air propelling or exhausting apparatus for ventilating and like purposes on board steam vessels.* Dated Mar. 29, 1856. (No. 753.)

This invention was described at page 347, of No. 1731.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

GIZARD, L. A. *Improvements in elastic mattresses and cushions.* Dated Mar. 25, 1856. (No. 703.)

This invention consists in the employment in mattresses and cushions of certain shaped pieces of caoutchouc for springs.

ASPINALL, J. *Improvements in apparatus for obtaining extracts and decoctions.* Dated Mar. 25, 1856. (No. 704.)

The action of the improved apparatus is as follows:—Supposing coffee to be the substance from which the extract is to be made, hot water is placed in the body of the vessel, and carried by heat applied under it by a spirit lamp, gas, or otherwise, to the boiling point. Ground coffee is placed between two perforated rings, and rotary motion is communicated to a shaft, whereby the liquid will be drawn up the inside of a conical pipe, be forced through the coffee, and return from the inside of the large ring into the vessel, to be again raised and returned as long as the rotary action is maintained.

SMITH, G. H. *An improvement in the manufacture of saucepans, kettles, and other like culinary utensils.* Dated Mar. 25, 1856. (No. 710.)

The inventor makes an opening in the lid to admit of the insertion of a spoon to take up a portion of the contents of the pot, and ascertain the progress of the cooking operation, and this opening he covers with a sliding plate, attached by preference to the knob of the lid, and capable of moving round with it to cover or uncover the opening as required.

ILLINGWORTH, W. *Certain improvements in printing or colouring china, earthenware, or other ceramic manufactures, and in the machinery or apparatus connected therewith, and also improvements in the subsequent treatment of such manufactures.* Dated Mar. 25, 1856. (No. 713.)

This invention relates—1. To an improvement in the use of the preparation which the inventor patented Oct. 1, 1855, and consists in a further use of saccharine matter, in combination with animal and vegetable mucilaginous substances, to be employed in lieu or in place of oil, &c., as hitherto employed in printing or colouring such manufactures. 2. To the machinery connected with printing pottery, and consists in the use of doctors in connection with the flat plates used for printing, for the purpose of clearing such plates in a similar manner to cylinder calico printing; and also, if preferred, in combination with the use of inking or colouring rollers for the flat plates. 3. To the treatment of pottery after printing, and consists in equalizing the power of suction or absorption of the glaze, both in the body of the ware and those parts which are printed upon, by dipping the newly printed ware into a thin mucilaginous solution either pure or mixed with acids. 4. To the "glaze" employed, the ordinary composition of which is improved by the introduction or admixture of mucilage.

WAILES, G. *Improvements in the means of actuating valves used for regulating the passage of gas or water in pipes..* Dated Mar. 25, 1856. (No. 714.)

This invention relates principally to valves in street and other mains, and consists in the application of eccentrics for communicating motion to such valves, and to regulate the area of passage through the valve.

WESTON, M., and O. CARTER. *Improvements in machinery or apparatus for setting saws.* Dated Mar. 26, 1856. (No. 716.)

The inventors make a frame to be fastened to a bench or table. A part of the frame slides in a slot to extend itself to suit the size of saw which is to rest on it. In the frame they fix a cutter with bevelled or

toothed edge, to be worked either by the hand or foot.

LILEY, J. *An improved case or sliding-tube for candles, telescopes, opera-glasses, and is especially applicable to portable articles for the toilette, in travelling, and is called "Debas-cylindrical-etui."* (A communication.) Dated Mar. 26, 1855. (No. 716.)

This apparatus consists of a portable case or barrel, having two grooves, one on each side, in which slides a piece of iron uniting a ring to a nut, in which passes a vice, held obliquely to the tube. This vice has a head, which, by turning the tube with the hand, suffices to make the ring turn up or down at pleasure, and consequently the article which it contains rises out of the tube or encloses it at pleasure.

SMITH, G. *Improvements in envelopes for containing letters or documents.* Dated Mar. 26, 1856. (No. 722.)

These improvements are designed for rendering envelopes, when sealed, secure against being opened and closed without detection, by piercing the tongue of the envelope with innumerable small holes, arranged in an ornamental fragile device, which is afterwards coated with adhesive material. Another mode is by attaching a delicate piece of perforated or plain paper to the under side of the tongue of the envelope. Another mode is by tracing a design with acid upon the tongue, or upon the thin paper, to destroy the tenacity of the fibres where the acid is without altering the appearance.

RANKIN, P. S *Improvements in communicating or transmitting motive power.* Dated Mar. 26, 1856. (No. 723.)

This invention consists of a certain duplex rack arrangement.

BARKER, W. R., and W. TOOGOOD. *Improvements in bottles, or in stoppering bottles, jars, and other receptacles.* Dated Mar. 26, 1856. (No. 724.)

This invention consists in closing the top of the neck of bottles, jars, &c., in making apertures in the side of the neck, and in fitting thereon a stopper, open, or partially open at the top, with lips and channels so formed that unless they are turned to correspond with the apertures in the side of the neck, the bottle or jar, &c., is closed.

TAYLOR, J., and J. GALLOWAY. *Improvements in gauges for indicating pressure.* Dated Mar. 27, 1856. (No. 729.)

This invention consists of a flexible diaphragm, and of a tube containing mercury or other fluid bearing upon the surface of the diaphragm. When the pressure to be indicated acts on the opposite surface of the diaphragm, the fluid is displaced and rises in the tube, indicating the pressure upon a graduated scale.

NICHOLLS, W. *An improvement in the manufacture of boots and shoes.* Dated Mar. 27, 1856. (No. 732.)

This invention consists in first sewing the upper leather of boots and shoes directly on to the inner sole, and in then stitching the upper leather to the outer sole, whereby all welts and stuffings are dispensed with, and the work being visible, the purchaser is enabled to reject any article not properly made.

CLIFF, J. *Improvements in machinery for cleansing casks.* Dated Mar. 27, 1856. (No. 735.)

This invention consists of certain frames, in which casks are suspended after having had placed in them water and brushes, or other cleansing agents, and in which the casks are made to partake simultaneously of to-and-fro and rotary motions.

BUFTON, E. *An improved ink for marking linen and other fabrics, and in the case or holder for containing the same, and the implements to be used therewith.* Dated Mar. 27, 1856. (No. 738.)

The improved ink consists in combining a salt of platinum with silver metal in the manufacture of an indelible marking ink for marking linen and other fabrics. The inventor also adds a portion of bi-chloride of platinum which he obtains in the usual chemical way. And as regards the case or holder, the improvement consists in so constructing the same as that the part which contains the ink holds also the bone or quill nibs, or other marking implements, and the holder slides within an outer case open at both ends.

MEYER, J. C. *Improvements in the construction of vices.* Dated Mar. 28, 1856. (No. 742.)

This invention consists of improvements in constructing vices with swivel jaws, to enable them to take hold securely of articles of a taper, conical, or irregular shape. One mode is in constructing and securing one of the jaws in the ordinary manner, and in supporting the lower end of the other jaw in a swivel piece, working in trunnions affixed to the lower part of the fixed jaw. The head of the screw is made partly spherical, fitting in a similarly shaped recess in the moveable jaw, which has a conical hole to allow the moveable jaw to swivel according to the shape of the article to be held. Another improvement consists in making adjustable pieces fitting in concave recesses in the jaws, by means whereof an equal pressure is exerted on all parts of the article held in the vice.

NEWTON, A. V. *An improved air engine for producing motive power by heated air.* (A communication.) Dated Mar. 28, 1856. (No. 751.)

This invention relates to an improvement

in the air engine patented by Mr. Ericsson in 1855. The leading feature of it consists in operating with one piston within a cylinder, in such a manner that one side of it shall compress the cold air which on the previous stroke enters one end of the cylinder, and cause it to pass through the regenerator and heater, or either, at the same time that the other side of the said piston is receiving the motive force of the heated air entering the cylinder from the opposite direction.

SANDS, A. *Improvements in securing rails in railway chairs, and in the construction of railway chairs.* Dated Mar. 28, 1856. (No. 752.)

This invention consists in the application of steady pins fixed into or projecting from railway chairs, and taking into holes or slots in the rails, for preventing the longitudinal and upward motion of the rails. Also, in the construction of such railway chairs as are put together in two parts. One part of the chair is furnished with a T-headed, or other suitably shaped projection, on which the other part fits, the two parts being connected together by a vertical key, the action of which causes the two parts of the chair to bind against and secure the rail. The holes or slots for the keys and steady pins, and the sides of the loose jaw, are cored out in the casting on chills or mandrils.

SWYNEY, J. *Improvements in breech-loading magazine fire-arms.* Dated Mar. 29, 1856. (No. 754.)

This invention cannot be described without illustrations.

POWELL, R. *A new method of making up cotton, linen, silk, woollen, and other textile fabrics, whether waterproofed or not, into wearing apparel, horse clothing, tents, tilts, and all other articles or things for which such fabrics are used, by which method the article or thing when made up and worn is perfectly ventilated.* Dated Mar. 29, 1856. (No. 757.)

The ventilation is effected by making holes in the material to be used, and protecting the holes either by stitching them round or by inserting metal eyelet holes, and on the outside of the article, further protecting the holes from the admission of wet by placing over them either a lapping seam fold, or a trimming of sufficient width to cover them.

PROVISIONAL PROTECTIONS.

Dated September 13, 1856.

2145. John Henry Johnson, [of Lincoln's-inn-fields, gentleman. Improvements in fire-arms. A communication.

Dated September 19, 1856.

2200. Archibald Templeton, of Skinner-street, London, and John Lawson, of Glasgow. Improvements in the manufacture of pile fabrics.

2206. John Underwood and Frederic Valentine Burt, of Fish-street-hill, London, stationers and printers. The manufacture of copying inks for printing.

Dated September 29, 1856.

2276. Richard Boycott, of Blaina, Monmouth. An improved air-door.

Dated October 14, 1856.[1]

2401. John Knowles, jun., of Saint Helens, Lancaster, mining engineer. An improved apparatus for the prevention of accidents in winding from mines, which apparatus is also applicable for other similar purposes.

Dated November 1, 1856.

2565. Peter Smith, of Liverpool, master mariner, and Thomas Irvine, of the same place, ship builder. Improvements in the masts, yards, and rigging of ships.

Dated November 5, 1856.

2592. André Jacques Isaac de Montenay du Minhy, of Blois, France, gentleman. Improvements in screw hand presses. A communication.

2594. Louis Urion, of Nancy, France, manufacturer. Improvements in machinery for the manufacture of matches and match boxes.

2596. Charles Titterton, of Roehampton, Surrey. Improvements in the manufacture of zinc and zinc white.

2598. William Edward Newton, of Chancery-lane, civil engineer. Improvements in steam engines. A communication.

2600. Herbert Keeling, of the King and Queen Iron Works, Rotherhithe, engineer. An improvement in riveting fish joints and other parts of the permanent way of railways.

2602. William Brindley, of Moorgate-street, paper manufacturer. Improvements in the preparation of paper hangings and other ornamental papers.

2604. John Stanley, mechanical engineer, of Whitechapel-road. Improvements in the construction of, and mode of applying, cranes and other machines to hoisting, suspending, and lowering purposes, also in generating, transmitting, and applying motive power to the same.

2606. Frederic Holdway, of Bayswater. Improvements in the manufacture of candles.

2608. Mannor Browne, of the Strand, commission agent. Certain improvements in shirts.

Dated November 6, 1856.

2610. George Henry Stevens, of Stafford-row, Pimlico, and Robert Fitch, of South Lambeth. Improvements in locking and unlocking jars, bottles, and other vessels, and making such vessels air tight.

2611. Joseph La Cabra, of Albany-street, pianoforte maker. Improvements in the action of pianofortes.

2612. Colin Hunter, of Islandreagh, Ireland, bleacher. Improvements in effecting the operations of drying, heating, and ventilating.

2613. Joseph Parker, of Blackburn, Lancaster, grocer and tea dealer. Certain improvements in machinery or apparatus for roasting coffee, or for other similar purposes.

2614. William Henry Olley, of Brabant-court, Philpot-lane, London, wine merchant. Improvements in obtaining photographic impressions or pictures of microscopic objects.

2615. James Webster, of Birmingham, Warwick, engineer. A new or improved instrument or apparatus for transmitting hydrostatic and pneumatic pressure, which said instrument or apparatus is applicable to pressure gauges, safety

valves, thermometers, pumps, and other like machines.

2616. Peter Cato, John Miller, jun., and John Audley, of Liverpool. Improvements in the manufacture of ships' knees.

2617. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in the manufacture of cranked axles and shafts. A communication from C. Russery.

2618. Frederic Chapman, of Piccadilly, gentleman, and Charles Bowyer, of Davies-street, gentleman. A method of purifying and disinfecting intestines and manufacturing gelatine therefrom.

Dated November 7, 1856.

2619. Henry Dircks, of Moorgate-street, engineer. Improvements in the preparation and application of the materials for making worts and washes in brewing, distilling and like operations, and in the apparatus connected with the same.

2620. Alexander Porecky, of Hackney, gentleman. Improvements in the construction of safety match or lucifer boxes.

2621. Thomas Ollis, jun., of Liverpool, engineer and machinist. Improvements in machinery or apparatus for cutting paper, card-board, millboard, scale-board, leather, and other substances of a light nature.

2622. William Spence, of Chancery-lane. Improvements in apparatus used in the manufacture of silk and other fibrous materials. A communication.

2623. Joseph Louis Casartelli, of Manchester, and Anthony Casartelli, and Louis Casartelli, of Liverpool, engineering instrument makers. Certain improved apparatus for ascertaining the density of water in marine steam boilers or generators, for the purpose of preventing saline incrustation.

2625. Louis Joseph Victor Vuitton, of Paris, mechanician. An improved apparatus for consuming smoke.

Dated November 8, 1856.

2626. James Dickinson, of Blackburn, Lancaster, cotton spinner. Improvements in machinery or apparatus used in the preparation of cotton or other fibrous substances for spinning.

2627. George Bertram, of Edinburgh, engineer, and William McNiven, manager, of Polton Mill, Lasswade. Improvements in the manufacture of paper.

2628. Lawford Huxtable, of Bristol, professor of music. Improvements in pianofortes.

2629. William Porter, of Lansdowne-villas, Brompton, Middlesex, civil engineer. Improvements in the grinding of cements and other substances, and in the construction of millstones for the same.

2631. Charles Vaughan, William James Vaughan, and Richard Vaughan, all of Birmingham, manufacturers and copartners. A new or improved strap or band for working stamps, raising weights, and transmitting power generally.

2632. Archibald Reid, of Sidmouth-street, Regent-square, mineralogist. Improvements in treating iron so as to render it impervious to continuous oxidation.

2633. William Morphet, of Leeds, cloth finisher. Improvements in producing the velvet pile and Witney finish in cloths and in machinery or apparatus for the same.

2635. Jean Baptiste Edouard Victor Alaux, of Paris, householder. A lubricating composition.

2636. Thomas Walker, of Balderstone, Lancaster, card maker. An improved method of lubricating the interior of the cylinders of steam engines for reducing the friction of the pistons thereof.

2637. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in preserving provisions. A communication from Garnier, Brothers, Faucheux, Tison, and Co.

2638. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in machinery for cutting and dressing stone, marble, and similar materials. A communication.

Dated November 10, 1856.

2639. Henry Bessemer, of Queen-street-place, London. Improvements in the manufacture and treatment of iron and in the manufacture of steel.

2640. Edwin Thomas Dolby, of Stratford-place, Camden-town, lithographic artist. Improvements in printing several colours at one time from a single stone, plate, or block.

2641. Andrew Barlow, of Shirley, Hants, brewer. Improvements in mashing apparatuses.

2642. François Jules Manceaux, of Paris, manufacturer, and Eugene Napoleon Vieillard, of the same place, gunsmith. An improvement in breech-loading fire-arms and ordnance.

2643. William Stones, of Greenhithe, Kent, paper manufacturer. An improved mode of sizeing paper.

2644. Peter Gaskell, of Kingston-upon-Hull, steam engine maker. The admission of steam into the cylinders of steam engines by an equilibrium valve.

2645. James Somerville, of Glasgow, manager. Improvements in weaving.

2646. John Henry Johnson, of Lincoln's-inn-fields, gentleman. Improvements in apparatus for printing electro-telegraphic despatches. A communication,

2647. Richard Pearcy, of Manchester, machinist, Improvements in machinery or apparatus for giving additional cohesiveness and torsion to fibrous substances in the drawing and other processes.

Dated November 11, 1856.

2648. William Smith, of Salisbury-street, Adelphi, civil engineer. Improvements in machinery for sewing cloth and other materials. A communication.

2649. John Fell Jones, of Birmingham, machinist. Improvements in the manufacture of rollers or cylinders for printing fabrics, and in machinery to be used in manufacturing the said rollers or cylinders.

2650. William Clark, of Chancery-lane, engineer. Improvements in the manufacture of barytes and strontian, and their salts, and in their application to various purposes. A communication.

2651. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in the manufacture of boots and shoes and other like articles. A communication from N. Gaillard.

2652. James Leadbetter, of Leeds, brazier. Improved means of obtaining motive power.

2653. Francis Frederick Clossmann, of Park-lane. Obtaining alcohol from certain substances not hitherto used for that purpose. A communication.

2654. Paul Rapsey Hodge, of Albion-grove, Barnsbury. Improvements in the manufacture of felted cloth. A communication.

2655. Hugh Baines, of Manchester, architect. Improved machinery or apparatus to be applied to hoisting and other lifting machines.

2656. John Henry Johnson, of Lincoln's-inn-fields, gentleman. Improvements in projectiles. A communication.

2657. Julian Bernard, of the Albany, Piccadilly, gentleman. Improvements in the manufacture or production of boots and shoes or coverings for the feet, and in the machinery or apparatus employed in such manufacture.

Dated November 12, 1856.

2659. William Lukyn, sen., of Broad-street, Nottingham, dentist. A buffer break for railway carriages or trucks attached to locomotive engines, whether one or more engines, for the conveyance of goods or passengers.

2661. William Weild, of Manchester, machinist. Improvements in machinery for doubling, twisting, and winding yarns or threads on to bobbins or spools.

2663. Henry Collett, of Grosvenor-street, Islington. Improvements in machinery for mowing and reaping.

2665. Arthur Maw, of Broseley, Salop, encaustic tile manufacturer. An improved mode of constructing the eccentrics or cams of steam engines and other machinery.

2667. Jean Charles Boulay, of Rue des Bernardins, Paris. An improved method of printing in various colours simultaneously.

2669. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. A new or improved felted fabric. A communication from F. Durand.

2671. William Green, jun., of Framwell-gate Colliery, near Durham, colliery viewer, and Thomas Storey, of the same place, engine wright. Improvements in machinery or apparatus for washing or cleaning coal.

Dated November 13, 1856.

2673. Thomas Wright Gardener Treeby, of Westbourne-terrace Villas, Paddington. Forming sewers or tunnels, and gulleys to sewers.

2675. Alexander Hutton, of Ardwick, Lancaster, gentleman. An improved warming apparatus, applicable to railway and road carriages, and other useful purposes.

2677. Samuel Newington, of Ticehurst, Sussex, doctor of medicine. Improvements in dibbling apparatus.

2679. William Francis and James Hooper, leather factors, of Leadenhall-street. Improvements in tanning and dyeing leather, linen, cotton, wool, hair, and silk, and fabrics composed of any of these substances.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

2720. William Healey, of Dorset-street, Salisbury-square, hydraulic engineer. Improvements in furnaces and boilers and hot water apparatus for heating purposes. Dated Nov. 18, 1856.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," November 25th*, 1856.)

1652. J. Rowley. Improvements in the manufacture of a material as a substitute for leather.

1657. W. Williams. Cutting and dressing stone by machinery.

1660. W. Clibran and J. Clibran. Improvements in apparatus or mechanism for regulating and measuring gas.

1661. W. Watt. Improvements in the manufacture of starch.

1671. J. Ford and P. Knowles. Improvements in machinery for cleaning and preparing cotton and other fibrous substances.

1673. R. Morgan. A pocket-case for containing address-cards, stamps, and other similar articles.

1674. T. Duncan. A combined and compound engine for applying motive power and for measuring fluids.

1675. D. Bowlas. Improvements in throstles and doubling frames for spinning and doubling cotton and other fibrous materials.

1681. H. Bragg, jun. Improvements in drying air, and in machinery for stretching, drying, and finishing fabrics.

1692. G. F. Hipkins and J. Britten. Improvements in applying springs or weights for the purpose of closing doors, or resisting shocks, strains, or pressure.

1694. P. H. Desvignes. Improvements in machinery for scutching or beating flax, hemp, and other fibrous materials requiring like treatment.

1697. J. Hamilton, jun. An improvement in the bending of sheet iron for the manufacture of conical tubes.

1702. W. Noton. Certain improvements in self-acting mules and other machines of the like nature for spinning and doubling.

1703. J. Ryder and D. Bentley. Improvements in machinery and apparatus for folding and measuring fabrics.

1706. J. Whitehouse, jun. Certain improvements in making, mounting, and spindling knobs applicable for doors and other purposes.

1709. J. Smith and E. Harrison. Improvements in machinery or apparatus for warping and beaming.

1710. E. W. Young. Improvements in the construction of bridges.

1716. M. A. A. Gaudin and E. X. Choumara. Manufacturing factitious wholesome milk.

1717. F. Barbour. Improvements in penholders. A communication.

1731. E. Weisskopf. An artificial combustible chiefly applicable to the kindling of fires.

1738. J. Brayshay. Certain improvements in boilers for generating steam.

1761. J. Mather and W. Forshaw. Certain improvements in pickers for looms and apparatus connected therewith.

1762. R. A. Brooman. Improvements in grindstones. A communication.

1782. G. C. Cooke. Improvements in stereoscopes.

1810. W. E. Newton. A new or improved process for obtaining aluminium. A communication.

1827. O. Long. Improvements in mechanical knife-cleaners.

1964. F. A. Gatty. Certain improvements in dyeing.

1976. M. A. F. Menuons. A new composition applicable to the coating or covering of metallic and non-metallic surfaces. A communication.

2069. R. Reeder. An improved universal dial and chronometer compass.

2258. W. Horsfall. An improvement or improvements in cards for carding fibrous substances.

2270. J. Rothwell. A certain composition and preparation to promote the ignition and combustion of coke, coal, and other combustible substances in stoves, furnaces, and grates.

2290. P. A. L. de Fontainemoreau. An improved voltaic battery. A communication.

2373. J. A. Labat, jun. Improvements in closing or stoppering bottles, jars, and other like vessels.

2480. G. Ermen. Certain improvements in machinery or apparatus for the finishing and treatment of yarns or threads.

2541. T. S. Henzell. Improvements in the construction of ships or vessels.

2567. J. Young. Improvements in flooring-cramps and lifting-jacks.

2575. J. Jobson. Improvements in the manufacture of railway chairs.

2578. S. Middleton. Improvements in the manufacture of certain articles of leather without seams.

2584. J. Murgatroyd. Improvements in machinery or apparatus for spinning, cleaning, doubling, and throwing silk, part of which improvements are applicable to machinery for roving and doubling cotton and other fibrous substances.

2590. W. E. Newton. Improved machinery for riming and tapping gas-fittings. A communication.
2597. J. Fernihough and R. Farrow. A self-acting apparatus for regulating the supply of atmospheric air to furnaces, gas-stoves, and other closed vessels used for the consumption of fuel or combustible gases, for preventing the formation of smoke therefrom, and thereby economising such fuel or combustible gases.
2614. W. H. Olley. Improvements in obtaining photographic impressions or pictures of microscopic objects.
2616. P. Cato, J. Miller, jun., and J. Audley. Improvements in the manufacture of ships' knees.
2619. H. Dircks. Improvements in the preparation and application of the materials for making worts and washes in brewing, distilling, and like operations, and in the apparatus connected with the same.
2627. G. Bertram and W. McNiven. Improvements in the manufacture of paper.
2629. W. Porter. Improvements in the grinding of cements and other substances, and in the construction of millstones for the same.
2636. T. Walker. An improved method of lubricating the interior of the cylinders of steam engines for reducing the friction of the pistons thereof.
2638. R. A. Brooman. Improvements in machinery for cutting and dressing stone, marble, and similar materials. A communication.
2641. A. Barlow. Improvements in mashing apparatuses.
2645. J. Somerville. Improvements in weaving.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

2679. William Taylor.
2683. Patrick Benignus O'Neill.
2684. John Harcourt Brown.
2689. Auguste Castets.
2691. William Austin.
2695. Emanuel Wharton.
2706. William Joyce and Thomas Meacham.
2714. Frederick Levick and Joseph Fieldhouse.
2716. Charles Ramsay.
2719. Benjamin Burleigh.
2723. John Hill, sen., and John Hill, jun.
2729. John Drumgoole Brady.
2737. Samuel Cunliffe Lister.
2740. Daniel Lancaster Banks.
2745. William Leigh Brook and Charles Brook, jun.
2747. John Henry Johnson.
2800. James Reilly.
2808. George Collier.

LIST OF SEALED PATENTS.

Sealed November 18, 1856.

1383. Henry Benson James.
1385. William Bayliss.
1461. George Davies.
1506. John Portus.
1605. Henry Page.
1687. Charles Carey.
1807. Constantine John Baptist Torassa.
1981. Henry Bessemer.
1987. Charles Carey.
2097. John Watson and Charles Frederic Halle.

Sealed November 21, 1856.

1244. William Illingworth.
1250. Benjamin Nadault de Buffon.
1277. Oldham Whittaker and Cyrus Wallwork.
1281. William Carr Hutton.
1285. Adolphe Bonvallet.
1321. Raymond Fletcher and Edwin Fletcher.
1325. Thomas Morris.
1418. Edouard Guérin.
1707. William Astbury Jump.
1972. George James Farmer.
2021. Hezekiah Conant.
2125. Richard Atkinson Coward.
2139. George Hutchison.
2180. George Davies.
2218. William Taylor.

Sealed November 25, 1856.

1260. Samuel Newington.
1270. Lemuel D. Owen.
1274. Charles Herbert Holt.
1298. Thomas Wilson.
1300. Stephen Rossin Parkhurst.
1304. Augustin Marie Herland.
1324. Joseph Briggs.
1328. William Potts.
1352. Thomas Chambers.
1382. William Wilson.
1552. James Fleming, jun.
1592. William Colborne Cambridge.
1856. Thomas Evans, jun.
1938. Henry Bessemer.
2102. Charles Brook, jun.
2124. Pier Alberto Balestrini.
2250. Robert Frost.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
Oct. 23	3894	A. J. Marriott	Oxford-street	Ladle pickle-fork.
30	3895	J. and F. Gleave	Chester	Weft-fork.
31	3896	G. Wood and Son	Chelmsford	Turnip-cutter.
,,	3897	Cope and Collinson	Birmingham	Lever table-catch.
Nov. 3	3898	J. Walker	Doncaster	Water-closet.
4	3899	T. O. and S. Jones	Newgate-street	Pocket-protector.
,,	3900	W. Russ	Clerkenwell	Bracelet-fastening.
6	3901	Key, Rudall, and Co.	Charing-cross	Portable Music-stand.
8	3902	Taylor, Allen, and Taylor	Birmingham	Rack-pulley.
,,	3903	J. Pedley	Manchester	Hot-water apparatus.
11	3904	H. Craigie	Edinburgh	Coffee-pot.
13	3905	L. Hicks & J. E. Smith.	Leeds	Rug or wrapper.
20	3906	*J. Large*	Berks	Clod-crusher.
21	*3907*	*Abercrombie* and Son..	Tottenham-court-road	Stay for windows, doors, &c.

PROVISIONAL REGISTRATIONS.

Oct. 24	806	T. J. M. Townsend	Searby	Ledge drain-pipe.
25	807	B. Richardson	Birmingham	Belt-fastening.
27	808	H. L. Burton	Islington	Washing-machine.
28	809	W. Deller	Crooked-lane	Angler's winch-handle.
,,	810	J. Dugard	Birmingham	Box for matches, &c.
31	811	T. O. and S. Jones	Newgate-street	Pocket-protector.
Nov. 7	812	Pollock and Wright	Hatton-garden	Bag-frame.
8	813	G. Bayley	Upper Thames-street	Waterproof cap, life-buoy, &c.
11	814	C. Bannister	Southwark	Safety-envelope.
,,	815	G. G. Bussey	New Oxford-street	Travelling-bags.
17	816	G. J. Calvert and Co.	York	Sawing & tenoning-machine.

NOTICES TO CORRESPONDENTS.

F. B. Whitaker.—The lists of patents and patentees at present published in this Magazine are considered sufficient. The patent you allude to is given under the name of the first patentee (Andrews) in the index of vol. lii., and in the patent list at page 180 of that vol. The contents now given on the last page of each number contain a chronological list of patentees and applicants for patents.

There is a small advantage derived from placing the gas burners in *metallic* stoves, but whether this is not counterbalanced by the disadvantages of the method cannot be determined without experiments.

One to Improve.—The object aimed at in the invention described by you might, we think, be effected in a way superior to that adopted in it.

A Subscriber of Many Years.—We cannot undertake to give descriptions of chemical processes in this Magazine, or we should be happy to oblige you.

Astro.—We cannot insert your letter,

Viator.—Information respecting the sale of the Vulcanized India Rubber Goods may be obtained, we believe, from Messrs. Goodyear and Co., 17, Leicester-square, London.

J. Hodson, and *Alpha.*—We will endeavour to obtain for you the required information.

W. Murray.—We cannot undertake to introduce inventors to capitalists.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

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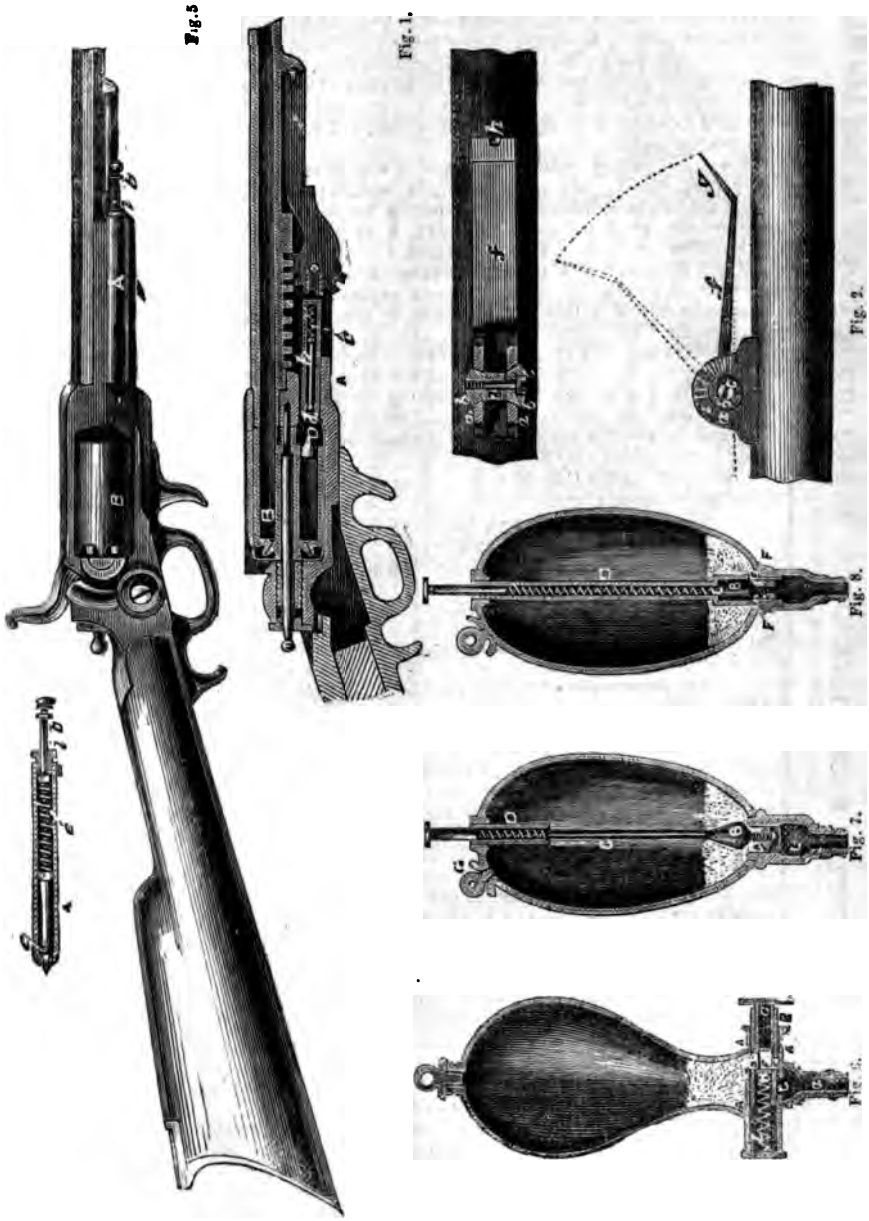
LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1739.] SATURDAY, DECEMBER 6, 1856. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

COLONEL COLT'S IMPROVEMENTS IN FIRE-ARMS AND POWDER FLASKS.



COLONEL COLT'S IMPROVEMENTS IN FIRE-ARMS AND POWDER FLASKS

COLONEL COLT, whose former improvements in fire-arms are known throughout the world, has just introduced an invention comprising a new method of fitting adjustable sights to fire-arms, a mode of preventing the fouling of the barrels of fire-arms, and an arrangement of powder-flask by which a charge of given amount is supplied. With the view to facilitate the adjustment, and to reduce the cost of sights for fire arms, Colonel Colt proposes to make the sight at the extremity of an arm which is connected with the barrel by a hinged friction joint, the friction thereof being capable of regulation by a temper screw without changing the position of the sight laterally. By this means the end of the arm in which the sight notch is formed can be elevated or depressed at pleasure to any angle to suit the required range, which angle is determined by an index, the friction being readily varied to admit of changing the elevation, and to insure the holding of the sight at any elevation desired.

Fig. 1 of the accompanying engravings is a plan of the improved adjustable sight on the barrel, showing the screws, &c., in section; and figure 2 is a side elevation. *a*, *a*, are two lugs, having each a tapering hole with the greatest diameter outside, and to these holes are fitted conical plugs, *b*, *b*, so that they can be made to turn with more or less friction, by the turning of a screw, *c*, which passes through a hole in one and is tapped into the other. This screw also passes through a hub, *d*, the ends of which are connected with the conical plugs by tongues, so that the hub and plugs shall turn together. From the hub, *d*, a thin strip of metal or arm, *f*, constituting the sight, projects forward, with the forward end turned up, as at *g*, and with a notch, *h*, cut in the end, through which to sight, in the usual manner. The face of one (or both) of the lugs, *a*, *a*, is graduated as at *i* to indicate the required elevation of the sight for various ranges, the arm, *f*, acting as the pointer. By turning the screw, *c*, the two plugs will be drawn towards each other, increase the friction, and render it more difficult to elevate or depress the sight, and *vice versâ*. A modification of the mode of construction above, is also described, and other modifications may be made without changing the principle of the invention.

The second part of the Colonel's invention consists in applying lubricating matter in the barrels of fire-arms after the ball has been inserted, either to the outer surface of the ball or the inner surface of the barrel, by means of which the fouling of the barrel by the leaden ball is prevented, and the passage of the ball in the discharge greatly facilitated, while at the same time the lubricating matter will be prevented from reaching the charge of powder.

The mode preferred of applying the improved method of lubrication to many-chambered rotary breech fire-arms is represented in figs. 3 and 4, in which A is a small metal tube attached to the under part of the barrel and by the side of the rammer. The axis of this tube is in a line with the bore of one of the chambers of the rotary breech, B, when another of the chambers is in a line with the barrel. A cylindrical stem, *b*, is fitted to slide in the tube, and passes through a hole in each end thereof. The outer end of this stem projects to a convenient distance beyond the outer end of the tube, and is there provided with a head or button, for the convenience of pushing it towards the breech; it is surrounded by a helical spring, *c*, by the tension of which the stem is drawn up to the position shown, but which admits of forcing the inner end down into the chamber which, for the time being, is in line. The tube is charged with oil (or other lubricating matter) through a hole provided with a plug, *i*. The surface of the stem, *b*, is recessed at *c*, so far within the inner end, that when it is drawn up by the tension of the spring, the end beyond the recess closes the aperture at the lower end of the tube; but when the stem is forced down, or towards the breech, the passage of the recess by the aperture of the tube permits the oil to run out and hang by capillary attraction on the lower end of the stem, which oil is then carried into one of the chambers of the breech, to be deposited on to the outer surface of the ball in the chamber, where it runs and spreads over the entire surface of the ball so exposed. No more oil than is required can escape, because it is only during the passage of the recess that the escape can take place. The portion of the surface of the ball which is towards the muzzle being thus coated with oil, as the ball is forced through the barrel by the discharge, the lubricated surface of the ball runs in contact with the bore, and thus effectually prevents the abrasion of the ball and the consequent fouling, and greatly reduces the friction, while, at the same time no portion of the oil can reach the charge of powder in the rear of the ball.

Instead of the mode of application above specified, the inventor also proposes the application of the invention to repeating fire-arms, having the many-chambered rotary breech, by forming the lubricating tube, A, in the manner usually employed for driving *or ramming* the balls down in the chambers, as they are successively brought in line *with the rammer* by the rotation of the breech. In this mode of application, which is

shown in fig. 5, the rammer is made tubular, with the head concave, to fit the surface of the ball, D. The bottom of this cavity is pierced with a small hole, communicating with a tubular part, A, which contains the oil. Within the tubular part there is a stem, *b*, surrounded and acted upon by a helical spring, *c*, which forces it downward, that its lower end, which is in the form of a valve, may close the aperture in the tube, to prevent the escape of the oil. The extreme end of the stem, *d*, projects within the concave recess of the rammer, so that, after the ball has been inserted in the chamber and brought under the rammer, in the act of forcing down the ball by the rammer the projecting part, *d*, of the stem comes in contact with the end of the ball, by which it is forced back to open the valve and permit the escape of the oil, which then spreads over the surface of the ball. The moment the rammer is lifted up, the tension of the spring forces the stem down to close the aperture, and prevent the further escape of oil. The rammer can be operated in the usual or any other convenient manner.

The same mode of application will answer for the rammers of muzzle-loading fire-arms.

Many-chambered rotary breech fire-arms may also be fitted with the lubricator by the side of the rammer, but the same being so connected with the rammer, that, by the act of ramming the ball in one chamber, the ball in the chamber next to it will be lubricated.

Many other changes may be made in the mode of application of the invention, such, for instance, as substituting a small pump or syringe for ejecting the oil and that the oil instead of being applied to the ball may be applied to the inner surface of the barrel after the ball has been rammed home, the object in each case being to lubricate the surfaces which act on each other as the ball is forced out of the barrel in the act of firing.

The last part of the invention consists in combining with the powder flask and charging muzzle there of, and interposed between the two, a sliding chamber to contain a charge of powder, and which in one position communicates with the flask to receive the charge of powder, the communication with the nozzle being at the time cut off, and which by simply sliding the same will first cut off the communication with the inside of the flask, and then communicate with the nozzle to discharge the contents of the chamber. And this part of the invention also consists in making one of the heads or partitions constituting the charging chamber, of a flask having the above features adjustable, to vary the size of charge.

Fig. 6 is a vertical section of the improved flask. A, is a cylindrical tube secured to the lower end of a flask, and at right angles to its length. The nozzle, *a*, of the flask is attached to the opposite side of the tube, A. One end of this tube is closed and the other open, and two holes are made through its periphery on opposite sides, one D communicating with the inside of the flask, and the other, *c*, with the nozzle. To the inside of the tube, A, is fitted, so as to slide therein, a second cylinder tube, B, with open ends, but with a partition, H, inside to form one end of the charging chamber, the other end of the said chamber being formed by an adjustable stopper, C, which can be moved at pleasure towards or from the partition, H, to regulate the capacity of the chamber to suit the required size of the charge. There are two holes cut through the tube, B, on opposite sides leading to the charging chamber, one F to communicate with the hole, D, leading to the inside of the flask, and the other, E, when the tube, B, is in the required position, to communicate with the hole, *c*, leading to the nozzle. There is a pin, *g*, (in dotted lines) projecting within the cylinder, A, and into a longitudinal slot, *s*, cut in the tube, B, to limit the extent to which the tube, B, can be made to slide within the tube, A, which sliding motion is given in one direction by a spring, I, and in the other by the hand of the operator. The extent of motion (which is determined by the slot *s* and pin *g*) and the position of the several holes, D, F and E, *c*, is such, that when the tube, B, is forced outward by the tension of the spring, the charging chamber shall be in communication with and receive the charge of powder from the flask, and when pushed by the hand in the opposite direction, the communication between the charging chamber and the flask shall be first closed, and then the communication of the said chamber with the nozzle established to discharge the charge of powder from the nozzle. The outer surface of the tube, B, is ribbed, so that when sliding within the tube, A, the amount of rubbing surface in contact with the inner surface of the tube, A, shall be very small, leaving cavities between the two surfaces, in which fine particles of powder will lodge, and thereby prevent the rubbing surfaces from fouling.

The improvements may also be applied in the form represented in fig. 7, in which A and B represent two plungers or pistons on a sliding-rod, C, at such distance apart as to form a chamber between of the required capacity to contain a charge of powder, the lower plunger being tapped or threaded on the stem of the rod, C, so that it can be made to approach or recede from the plunger, B, to vary the charge. The plungers are drawn up by a spiral spring within a tube, D. When the rod and plungers are drawn up by the

spring, the lower plunger, A, is in the cylindrical chamber, and the plunger, B, above it in the flask, so that the powder from the flask can run in to fill the space between the two plungers; and as the rod and plungers are forced down by the hand of the operator, the plunger, B, first enters the cylindrical chamber to cut off the communication with the powder inside the flask, and the plunger, A, passes out into an enlargement, L, to allow the charge of powder to pass out through the nozzle. The upper part of the flask is provided with a stopper, G, for charging the flask with powder. The modification represented by fig. 8, only differs from that represented in fig. 7, in having the tube, D, extend down to the cylindrical chamber, K, to form a continuation thereof for the plungers to work in, the said tube having apertures, F, F, for the powder to pass from the flask into the charging chamber between the two plungers.

THE LONDON MECHANICS' INSTITUTION.

THIS institution—the parent of 600 English Mechanics' Institutions—after an existence of thirty-three years, is threatened with dissolution. As a last resource, its members have resolved to approach the Lords of the Treasury, in the true spirit of petitioners. "Its finances are in such a state that it cannot continue without exterior aid," and they therefore will pray a grant of public money, stipulating, that, if their prayer is acceded to, the Board of Management will undertake "to procure other contributions equal to the Government grant." In compliance with the resolution of the members, the officers have memorialised the Treasury.

Most of our readers are aware that the London Mechanics' Institution, from which so many others have sprung, is itself the offspring of this *Mechanics' Magazine*. The "Memorial" to the Treasury mentions Dr. Birkbeck as its initiator and founder, and speaks of his efforts to complete the work he had begun; and Mr. J. R. Taylor, the present Honorary Secretary of the Institution, in a recent letter to the morning papers, states that it "was established by the late Dr. Birkbeck, in conjunction with Lord Brougham, Sir John Key, Bart., the late Duke of Sussex, Sir Francis Burdett, Professor Millington," &c.* These false representations have already misled one or two of our contemporaries, but a letter in the *Daily News* of October 27, has made the truth of the case known to them. The writer, Mr. Thomas Hodgskin, of Islington, thus states what occurred:

"In 1823, the late Mr. Joseph Clinton Robertson, then the editor of the *Mechanics' Magazine*, conceived the idea of such an institute in London, and whatever merit is due to such a conception, the parentage of mechanics' institutes throughout the country, belongs exclusively to him. The School of Arts in Edinburgh was previously in existence, and Dr. Birkbeck had before given lectures to mechanics on mechanical subjects at the Andersonian Institution, Glasgow. But having no connection or communication whatever with Dr. Birkbeck, Mr. Robertson published in the Magazine an address, which I wrote at his suggestion, to incite the people to form by their own means an establishment to promote their own improvement, especially in a knowledge of the physical sciences. The address was favourably received. In 1822, the price of wheat had fallen to 44s. 7d., the people were comparatively prosperous; they were full of hope and enterprise; the number of commitments and the expense of pauperism were declining; the Magazine was popular, and a considerable number of persons, including mechanics who could think, but could not spell, communicated to the Magazine their desire to promote such a project. One of the many persons who immediately took an interest in the matter was Dr. Birkbeck, whose antecedents, station, and zeal in the cause, placed him at once at the head of the movement. The first step was vigorously followed up by the Magazine, and the result was a great public meeting, held at the Crown and Anchor Tavern, in the Strand, over which Dr. Birkbeck presided, and at which resolutions to form such an institute were adopted, and money for the purpose was subscribed. Lord Brougham, then Mr. Brougham, gave his support to the project, so did Sir Francis Burdett, moved thereto by the late Mr. Place, so did Professor Millington, so did the late Mr. Cobbett and other persons, though amongst them were not many eminent scientific and literary men. After the public meeting and the subscriptions, the organization ensued, and Dr. Birkbeck was most appropriately elected president. By his exertions—his purse as well as his time being freely given—in co-operation with others, the institute was established, and was for a time eminently successful. His great services and his great merit are unquestioned, but to place Lord Brougham, Sir John Key, Bart., the late Duke of Sussex, Sir Francis Burdett, and Professor Millington, in conjunction with him as establishing the institute, and to ignore Mr. Robertson and the Magazine, is a laughable absurdity, as well as a gross injustice."

Mr. Taylor replied or rather responded to this letter, but not, in our judgment, in a satisfactory manner. He admitted, as he was obliged to do, the accuracy of all that Mr. Hodgskin stated, but with an apparent indisposition to let the facts have their just

* Colonel Sykes, in his address to the Society of *Arts, Nov. 21*, makes a similar statement, or *appears to do so.*

prominence. His omission was "an act of inadvertence" on his part, "arising purely from the multiplicity of great and valued supporters whose names should have been also recorded." He forgot the *originator* because there were so many who *supported* what he originated!

But enough of this: the London Mechanics' Institute is ready to perish, and the Magazine which gave it birth would fain aid it in its struggle for life. We have, we confess, a repugnance to the very appearance of an attempt to force artificial life into the various institutions that surround us. We hate the habit, now so general, of establishing Mechanics' Institutes, and Athenæums, and churches, and chapels, and trusting to casual and extraneous aid for the payment of liabilities incurred. We abhor the practice of creating debts ourselves, and then transferring the burden of them to the shoulders of those who succeed us. We infinitely prefer to see men, and associations of men, have what they are themselves able and willing to pay for, and dispense with all but this.

Yet, we would plead for this London Mechanics' Institution, because of its special claims and recommendations. We would plead for it on account of its long existence, its paternal honour, its past efficacy, its present utility, its future promise. We would plead for it because its continuance would be to our honour, as a city and a nation, while its annihilation would be to our certain shame and our deep disgrace.

If this Institution die, it will die of debt alone. Money is the only nourishment it needs. It owes to the executors of Dr. Birkbeck £3,000, and the demand upon its limited income for the payment of the interest of this sum is ruining it. Will the friends of education, the friends of progress, the friends of human enlightenment allow its ruin to become utter? Let the 600 institutions which have sprung from it combine to say—No. How small an effort in each would sweep the debt itself away!

It has been announced that a public meeting in aid of the institution will be held upon the assembling of Parliament, and that many Noblemen and friends of education are expected to be present. Public meetings and speeches—particularly the speeches of Noblemen—are doubtless wonderfully valuable things in their way, but our hope in this case lies, not in them, but in that noble spontaneous liberality which abounds in this nation, and which has given new life to many a cause less deserving than that of the London Mechanics' Institution.

ON THE IMPROVEMENT OF RAILWAY LOCOMOTIVE STOCK, AND THE REDUCTION OF THE WORKING EXPENSES.

BY DANIEL KINNEAR CLARK, ASSOC. INST. C.E.

(*Concluded from p. 509.*)

To compare the performance of the outside-cylinder *coal*-burning engine with ordinary outside-cylinder *coke*-burning engines, the author adduces some of the results of trials made by himself on the Caledonian Railway, in 1850, with an express engine; and also the results of experiments by Messrs. Woods and Marshall on the London and North-Western Railway, in 1853. It appears from the Table, 1st. That the Caledonian engine used the same fuel per mile to do only 60 per cent. of the gross duty performed by the South-Western engine. 2nd. That the North-Western outside-cylinder engine, drawing nearly the same gross load, 96 tons, consumes double the weight of fuel used by the South-Western engine. 3rdly. That the two North-Western outside-cylinder engines, taking the heavy load, 227 tons gross, consumes 53 per cent. more fuel than is used by the South-Western engine; the speed, however, being greater by 4 miles per hour, whilst the load is less by 9 tons. If the gross consumption in the South-Western engine be compared with the other results, it would compare of course less favourably; but the data for this are wanting.

Second, as to Water.—The quality of the water supplied to locomotive boilers has much to do with their efficiency. In Ireland, the contrast afforded by the use of hard water from calcareous soils, and soft water from boggy soils, in neighbouring districts, are instructive; for whereas the hard water has been known to terminate the useful existence of the fire-box and tubes of boilers within three years, the boilers fed with bog-water have lasted in good order eight or nine years.

The injury inflicted upon those parts of the machinery working amongst the steam raised from bad water, as the valves, pistons, and glands, is also considerable; for grit and mud are carried over in suspension, and accelerate the wear of such parts.

The direct loss of heat by priming, also, is 9 to 10 per cent. of the whole heat thrown into the boiler.

Upon the whole, the author is of opinion that at least 10 per cent. of the working charges affected by the quality of the feed-water, due to bad water, may be economised by the use of good water. Mr. Forsyth estimates an economy of at least 12 per cent. in fuel and wear and tear of parts affected.

The remedy seems obvious: purify the water before its admission into the system, by filtering-beds, in the case of mechanical impurities; or, for chemical impurities, by the application of chemical antidotes on a large scale in the tanks or reservoirs holding the water in store. The author suggested this course in 1853, and it has been brought into practice with beneficial results. For chemical impurities every quality of water must be analyzed and prescribed for individually. This can be done at a very small cost.

Third, as to the Grate-area and Heating Surface.—This question was discussed at length by the author in his paper of 1853, and from the experiments and observations therein detailed, he concluded that the grate-area should be proportioned to the heating surface, as well as to the evaporative power, in order to insure the most economical performance. The special proportions most suitable for coal are different to those for coke; and it remains a matter for future trial and observation to determine comprehensively the conditions of the best performance of coal in locomotives.

OF THE ENGINE.

The engine proper is the dispenser of the steam power from the boiler, comprising the cylinders, pistons, driving wheels, and gearing. The general conditions of best action are, that the steam should be freely admitted into the cylinders, and freely exhausted; that it should be efficiently worked by variable expansion gear; and that it should be well protected from condensation by exposure. It may be added, that the steam should be not merely protected, but superheated also.

The author, in place of bringing forward his most recent observations on the action of steam in the cylinder, extracted his conclusions on that subject from his work on Railway Machinery.*

Expansive working in locomotives can be done well and economically by means of the link-motion. The steam may be admitted freely and expanded sufficiently; it may also be exhausted freely, as, by a suitable arrangement of the smoke-box and the blast-pipe, back exhaust pressure on the piston can be entirely removed. Expansion may be carried, by the agency of the link-motion, to eight times—that is, the steam may be cut off at 1-8th. In exposed cylinders, the condensation of steam is considerable, the per centage increasing with the degree of expansion, until, in cutting off at 1-8th, the loss may amount to 60 per cent. of the whole steam admitted into the cylinder. Incidentally, outside cylinders are more exposed than inside, and therefore in the former the condensation is generally greater than in the latter; this explains how, in popular language, outside cylinders are said to prime more than inside.

The remedies are, to protect the cylinders from external cooling, and to superheat the steam, either on its way to the cylinders, or while it is within the cylinders, by external application of heat. The additional supply of heat is beneficial also in evaporating the water which, more or less, primes over with the steam from the boiler.

The saving of fuel realizable by such means should be, at the lowest estimate, 10 per cent.; it might, and probably would be, much greater if applied in the best manner.

The average period of admission of steam into the cylinders, even on light duty, is as much as from 40 to 50 per cent. of the stroke. There is no great difficulty in arranging for general practice, to cut off at least as early as at 1-5th of the stroke, which would economize 25 per cent. of the fuel consumed for an average period of admission of 4-9ths of the stroke.

The slide-valves working under steam-pressure on the backs of them, offer considerable resistance to motion. Unbalanced slide-valves ought to be superseded by the application of means for preventing the incumbent pressure. If an inference may be based upon the coefficient of friction between cast-iron and brass, which is about 1-5th of the pressure, the resistance of an ordinary valve of 120 square inches area, under 100 lbs. steam would be about 1 ton. With an average travel of 4 inches, and 5½ feet driving wheels, the resistance of two such valves would be represented by 185 lbs. traction at the rails, or 1¼ lbs. per ton, of a gross average load of 150 tons, equal to 6 per cent. of the whole power required to draw the train at 30 miles per hour, allowing a resistance equal to 20 lbs. per ton gross.

The result obtained by Mr. C. W. Siemens, from his regenerative engines, was remarked. These engines consist of three cylinders, and the principle of their action is, that a given volume of steam is alternately expanded and compressed, and is, simultaneously with these changes, superheated and reduced to its normal state of saturation. Thus, the duty of the fuel consumed, is only to replace the heat directly absorbed in expansion behind the working pistons:—the latent heat of the steam, which constitutes by far the greater proportion of heat expended in ordinary steam engines, is preserved, and a corresponding economy is effected amounting practically,

* *Vide* "Railway Machinery," pp. 97, 119, and 120.

it is said, to more than two-thirds of the fuel consumed by the best engines at present in use.

OF THE CARRIAGE.

In the design of the carriage, it is required that a sufficiency of weight should be placed on the driving wheels for adhesion, and that the machine should run freely and steady at all speeds.

In the earlier classes of engines, various circumstances operated to make them unsteady—a short wheel-base, the overhanging masses, the unbalanced revolving and reciprocating masses of the crank and the piston and its appendages. The evils were aggravated with outside cylinders, on account of the greater spread laterally of the swinging masses. These evils were sought to be remedied by various experiments:—The extension of the wheel-base, lowering the boiler, loading the foot-plate behind the fire-box with cast-iron, coupling the engine very stiffly to the tender, the use of three balanced cylinders, stiffening the frame, and the most prominent expedient of all, placing the driving-wheel behind the fire-box.

The distinguishing features successively adopted in locomotives were alluded to succinctly. The form primitively adopted in the "Planet," by Stephenson, was with four wheels and inside cylinders. This arrangement was succeeded in Stephenson's practice by an engine with a third pair of wheels behind the fire-box, to check the vertical pendulous movement of the engine. Expansions of this arrangement were, the inside cylinder engines of Sharp, Wilson, Kitson, Bury, Stephenson, Hawthorn, and Gooch. The course of improvement in outside-cylinder engines, was taken up by Stephenson, Stirling, Allan, J. V. Gooch, Crampton, and Adams. An adaptation of driving-wheels behind the fire-box to inside-cylinders was made; and Stephenson's method of hind drivers was applied by Mr. Adams to light tank engines on four wheels. The position of the centre of gravity, horizontally, in each of the engines, may be deduced by a simple process from the loads on the wheels.

The remarkable uniformity with which the leading idea of a central driving axle in front of the fire-box, initiated by Stephenson, is adopted by almost all the others, will be noticed. The reasons are not difficult of appreciation. First, there is the demand for a sufficiency of driving weight, to supply the required adhesion for traction; but the apportioning of the driving weight to one pair of wheels must be executed with a regard to the requirements of the others, which are carrying wheels simply. The front wheels lead the engine, and the hind wheels, as carriers, steady it; thus, the front wheels require a greater load than the hind wheels, but not so much as the drivers. It follows that for the driving wheels of single engines, the most likely situation is at some little distance behind the centre of gravity of the whole machine, because the supply of load to the drivers in that situation is the most direct; and, in the adjustment of the driving load, the loads on the other wheels are individually less affected than when the drivers are far from the centre of gravity. The first objection to the system introduced by Mr. Crampton is a deficiency of driving weight, or the alternative, an extra weight of engine.

In Crampton's engines, again, the loads being thrown mainly on the extreme axles, the engine runs heavily and severely along curves, which is proved by the greater wear of the leading wheel-flanges in them than in ordinary engines. Moreover, in this system an injurious extension of wheel-base is incurred through the necessity for placing the leading wheels far forward, to relieve them as much as possible of what is to them superfluous load. The labour of passing along curves also increases with the extension of the base.

All these objections are avoidable in the ordinary system with central drivers; and this system only wants maturing to make it quite satisfactory. The one primary and sufficient condition is, that the revolving and reciprocating masses of the pistons, piston rods, cross-heads, connecting rods, and cranks should be balanced in the wheels. This condition was pointed out ten years ago by Mr. Stephenson, in his evidence before the Gauge Commissioners, in 1845; and he at the same time exposed the fallacy that the action of the steam on the pistons had anything necessarily to do with unsteadiness. A complete balance can be effected, and it has been done by the author, for the first time in this country so far as he is aware, in the outside-cylinder engines of the Great North of Scotland Railway, designed by him. These engines run with absolute steadiness at the highest speed attained on that line, without the least internal disturbing action of any kind.

All classes of engines, with inside or outside cylinders, single or coupled wheels, may be satisfactorily balanced on the principle above indicated. In general, the locomotive stock of this country is very imperfectly balanced.

Economy of fuel is materially promoted by the correct equilibration of engines. With Mr. Beattie's permission, the author recently put in balance the "Canute" engine, to supply an example. This engine, had previously a balance-weight of 85 lbs. applied within the rims of the driving

wheels. New weights were put in, weighing 186 lbs. for each wheel, and balancing the whole mass, acting at the crank-pin. The engine ran so much more steadily and freely with the new balance-weights as to take the engineman by surprise. From experiments made in working the main line trains, 4·2 lbs. per mile is found to represent the presumable saving in fuel, due to the complete equilibration of the "Canute," amounting to 20 per cent. of the original consumption. As this deduction is based on a rather circuitous process of reasoning, only one-half, or 10 per cent., was adopted as the presumable saving.

The "Norman," an outside-cylinder coupled goods-engine, on the South-Western Railway, was also equilibrated according to the plans of the author. Such engines, unbalanced, are the most unstable of all. The engine and tender, with the balance-weights complete, ran at more than sixty miles per hour, with perfect steadiness, excepting the disturbances due to the road, there not being the least oscillating motion of any kind. The counter-weights were taken out of the wheels, and then so violent was the oscillation of the engine, both laterally and fore-and-aft, and so violent also the concussions between the engine and the tender, that the engineman could not venture to exceed a speed of about twenty miles per hour; and two strong hooks between the engine and tender were successively broken across, owing to the lurches of the engine.

CONCLUSION.

The economy of working expenses due to the improvements described, may be estimated on the following assumptions: First, that the consumption of fuel may be accepted as an index to the working charges generally of locomotive stock. This principle was maintained by the late John Gray, in 1845, and was at that time confirmed by the experience of the Manchester and Leeds and other railways. Second, that the average costs per ton of coal and coke, for locomotive purposes, are as two to three generally.

Economy with respect to the boiler.—The substitution of coal for coke, which is equally efficient, weight for weight, reduces the cost for fuel 33 per cent. The use of an efficient feed-water heating apparatus economises generally 15 per cent. of the fuel. The use of pure feed-water instead of the ordinary unprepared water may economise 10 per cent. of fuel.

Economy with respect to the engine.—The *thorough* protection of the cylinders, and *superheating* of the steam, may economise *at least* 10 per cent. of fuel. Promoting the expansive working of steam may economise 25 per cent. of fuel.

Economy with respect to the carriage.—The correct equilibration of the engine, to insure steady running, economises 10 per cent. of the fuel consumed by an unbalanced engine. This may be accepted as an average result.

Putting together, by a process of compound reduction, these items of economy, it appears that by purifying and heating the feed-water, by superheating the steam, and protecting the cylinders, by greater expansive working, and by correct equilibration of the engine, a joint economy of about 54 per cent. may be effected. Further, by substituting coal for coke as fuel, and properly burning it, a reduction of 33 per cent. in cost of fuel may be effected. The cost of fuel may be averaged at one-third of the total locomotive charges, and a reduction of 33 per cent. in cost is therefore equivalent to a reduction of 11 per cent. of the total charges. Applying this reduction, there is a gross resulting economy of 58 per cent. of the locomotive charges. A reduced economy of 50 per cent. may be accepted as the probable gross average saving that may be effected in the consumption of fuel and generally in the working charges of the locomotive stock of the railways of the United Kingdom.

According to Mr. Chattaway,* the average cost of locomotive power is 13·66 per cent. of the receipts. The estimated saving would therefore amount to about 7 per cent. on the receipts. It may further be inferred from his statements, that the average apportionment of the receipts on the railways of this country is as follows:

	Per cent.
Working charges	46½
Interest on guaranteed capital .	28½
Dividends in respect of ordinary shares	25
Gross receipts . .	100

The estimated saving, 7 per cent., would, to that extent, reduce the working charges, and raise the available dividend on ordinary share-capital from 25 to 32 per cent. of the gross receipts; or, as, according to Mr. Chattaway, the average dividend on ordinary share-capital is 3·14 per cent. per annum, it would be raised, according to the above estimate, to 4 per cent per annum.

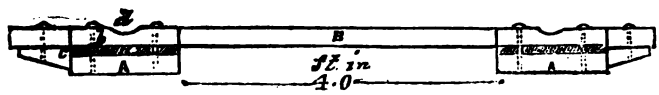
The author acknowledges the incompleteness of this investigation. His object has been to direct the attention of engineers to the saving that may yet be effected in the working of locomotive stock.

* Vide "Railways, their Capital and Dividends," 1855-56.

GREENSHIELDS' IMPROVED RAILWAY SLEEPERS.

An improvement in the construction of railway sleepers has been introduced by Mr. T. Greenshields, of London. It consists in constructing a transverse wooden sleeper so as to develope the efficiency of wood as a material best adapted to lessen the injurious effects of percussion, caused by trains passing at great speed over bearing parts placed at intervals; and in order to obtain the greatest amount of advantage from the elastic quality of the wood, the bottom of the rail, instead of having about three inches bearing in a cast iron chair, has a direct bearing of eighteen inches on wooden blocks, which act to a certain and limited extent as buffers. By this means a much greater bearing surface is obtained than with the ordinary cast iron chair and wooden sleeper. The rail is secured in position by a chair made of wrought iron, so constructed as to yield an elasticity, but controlled by that possessed by the wood, the centre part of the chair being sunk to give the rail a direct bearing on the wood, thus lessening the injurious effect of percussion on the machinery of the engine, the surface of the rail, and the material of the sleeper. The wrought iron chair being sunk in the centre and let into the sleeper, is intended to give greater security, particularly in passing round curves, as the chair by this means is not dependant on the pins only to keep it from shifting.

In the engraving is shown a complete "transverse buffer sleeper," as it is termed, composed of two blocks A, A, and a tie plank B. The blocks, A, A, are formed with pieces 3 ins. in thickness, and have a base of 18 ins. long, 12 ins. wide, and 7 ins. thick. Each block is made of two thicknesses, with a tie board *a*, *a*, fastened between them, the grain of the tie board being placed transverse to the grain of the other pieces.



The two pieces *b*, *b*, forming part of the top of the block, are each to be 12 ins. long, 4½ ins. wide, and 3 ins. thick. Each piece is to be secured in its place by two spikes driven through the whole thickness of the block, and clinched or riveted. *d*, is the groove made to receive the bottom of the rail. The tie plank B, is 7 feet long, 9 ins. wide, and 3 ins. thick. The chair is fixed on this plank, and it serves to keep the rail in gauge. The bolts that fasten the chairs pass through into the blocks, and assist to secure the plank to the blocks A, A; and the two ledges *c*, *c*, spiked or riveted on the ends of the plank B, prevent it from splitting, and with the bolts of the chair keep the sleeper in position; the dotted line *e*, *e*, shows the depression made to receive the centre part of the wrought iron chair. The above dimensions may be varied.

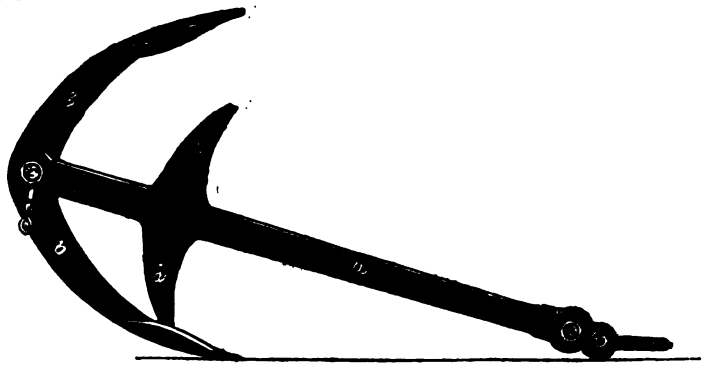
The wood to be used in the construction of the blocks or tie planks, when cut to the size required, is prepared in the following manner:—In a suitable vessel to 1 gall. of rain or soft water is to be added, and well mixed, 4 oz. of common salt and 2 oz. of alum, and the temperature raised to and kept at about 96° of Fahr. The pieces of wood are to be kept in this solution from four to six hours, according to its density; then taken out, and placed on the ends to drain. When thoroughly drained, it is to be dried at a temperature not exceeding 80° of Fahr. When dry, the surfaces forming the joints are to be paid over with a hot mixture prepared as follows:—In a suitable vessel put 10 parts of tallow elaine, 14 parts of gas tar (previously boiled down to an asphalte), and 1 part of resin, the whole to be heated and well incorporated before using, and to be applied hot to the surfaces mentioned, and also to the ends of the grain of the wood, the coating to be continued until it bears out on the surface like a coat of paint.

CROSBY HALL EVENING CLASSES.

Mr. Leone Levi, the professor of banking and commercial law, has been engaged to deliver a course of six lectures on the principles of banking, in Crosby Hall, Bishopsgate-street, before the Young Men's Evening Classes, to commence on the second Tuesday in January. It is probable that Mr. Levi will deliver the same course of lectures before the members of some other literary and scientific institutions in London and the vicinity.

HUNTER'S PATENT ANCHOR.

Mr. Samuel Hunter, of the Dock and Anchor Works, Hartlepool, has patented an improvement in anchors, applicable to that class of anchors where the arms move on pin joints at the ends of the stems. The improvement consists in applying to the two sides of the shank of an anchor a projection or palm, against which the palm with its arm which takes the ground rests, and is thereby prevented coming to the stem. By this arrangement, the palm and arm of the anchor are better ensured opening out, and at the same time the projecting palm fixed to or formed with the stem of the anchor itself acts as a palm to hold in the ground; the upper palm with its arm is also prevented coming so near to the stem of the anchor as heretofore, which is an advantage, and the dispensing with the toggles renders the anchor less liable to foul.



The engraving represents a side view of the improved anchor. *a* is the stem or shank; *b* are the arms and flukes; *c* is the pin which connects these parts together. On the shank, *a*, two projections with flukes or palms, *d d*, are formed, and on the points of these projections the palms or flukes of the arms, *b*, come when the anchor takes the ground. The fluke or palm on the arm, *b*, which is uppermost, comes on to the uppermost palm, *d*, when the lower palms, *b* and *d*, are holding in the ground.

RIG FOR VESSELS.

To the Editor of the Mechanics' Magazine.

Sir,—I wish, if you please, to make a few remarks with reference to the "Improved Rig for Vessels," described (from the *Scientific American*) in your Magazine of November 1.

The invention consists in introducing an extra sail between the course and topsail, for which purpose the inventor proposes increasing the lengths of the lower masts. Now the article in question states that the weight carried aloft is no greater than that involved in the ordinary rig. This does *not* to me appear very obvious; for since an additional yard is introduced, at the same time observing that the *lower yard* cannot be *consistently* reduced either in diameter or length from the original, we *must* have the weight of the middle, or storm yard, in addition to that of the ordinary rig. And having this yard and gear, it will be necessary, on increasing the lengths of lower masts to increase the diameters, so that we have also the additional weight of lower masts, which would not be compensated for by the reduction in length and diameter of the topmasts.

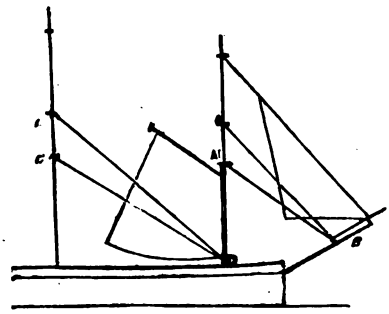
Again, we should require an extra set of *gear* for the storm-yard and sail, similar to that in present use for the ordinary course, and, it is evident, an accumulation of gear is objectionable in the working of the ship.

Again, the division of the shrouds is alleged to afford a better support. This cannot vary much from the present arrangement; for since the length from deck to hounds in the original rig and the lower shrouds in the proposed would not vary much, the support cannot be increased considerably.

With respect also to the arrangement of the fore and main stays, single stays, as shown on the accompanying sketch by A B, C D, would not give the required support; and supposing double stays were introduced in a similar manner to the double shrouds, as shown by A B, A'B, C D, C'D, it would be objectionable on going about, on account of the fore topmast staysail and fore trysail sheets.

In order that the ordinary casualties in reefing may be obviated, I would suggest the adoption of *Cunningham's patent self-*

reefing topsail, observing that some of the largest merchant ships are being fitted with that important nautical invention, which I



am pleased to find has more than once been noticed with much favour in your pages. I beg to enclose a list of a few of the vessels thus fitted. I remain, Sir, &c.

VOILIER.

List of some of the Ships fitted with Cunningham's Self-reefing Topsails.

Sailing Ship.	Tons Register.
Columbian	2,500
Donald M'Kay	2,560
Eastern Monarch	1,900
England	1,150
Ethereal	606
Gertrude	946
Great Tasmania	2,163
Ireland	1,150
Istamboul	1,400
Oneida	2,400
Scotland	1,150
South Sea	953
Sydenham	2,160

CAOUTCHOUC (INDIA-RUBBER) AND ITS ADULTERATIONS.

To the Editor of the Mechanics' Magazine.

SIR,—In reading over the papers on the subject of the above "popular inquiry" inserted in your spirited Magazine, and bearing dates respectively August 9th, September 20th, October 4th, and October the 24th, I am led to remark that I trust both engineers and dealers who are at all interested or in favour of caoutchouc goods, have secured the above copies. They will add to their reputation, and save thereby many a sovereign, if they will only learn experience and practice from the facts therein published. Those facts will enable them also to know to a certainty who of the manufacturers are the least scrupulous, and the most lost to all sense of shame, in these adulterating times. This is what I want to bring home to their very doors. There are many most respectable manufacturers, and these should have their sense of honourable integrity acknowledged, and, as far as possible, be protected from their inferiors in morality. In writing these papers off hastily, Sir, one is really tempted to get into a violent rage with this vicious system; especially when one calls to mind that, no sooner does an ingenious man invent a something really valuable and useful, but these kidnapping and adulterating traders counterfeit the same instantly, and render their make to all appearance (and to the unsuspecting) equally good, though, in reality, not so, being merely cheapened by this adulterating and tricky system. Added to which, if the originator is not very sharp in obtaining his protection for the really valuable service he has rendered to science, and to the sale of which he is looking very naturally and justly as a remuneration of what may probably have cost the inventor many days and nights of weariness, and possibly involved the spending of his money capital, and perhaps, even besides, months of labour, disappointment, poverty, and sorrow,—I say, Sir, if he is not very quick in his protection, the unblushing effrontery and impudence of these "second-hand people" will rob him of the whole. I believe no pen can sufficiently protest against those individuals who thrive "and make haste to become rich" from the oozings of other men's brains. Theirs is the basest class of felony our laws cannot reach, and, consequently, their infamous and nefarious habit continues unheeded and untouched, and often (because unknown) unscorned. This applies to "caoutchouc." Special reference to particular manufactures must be discussed another day; but, if I am rightly informed, Mr. C. Goodyear especially, and others, to some extent, have suffered from these copyists very grievously and seriously. Though my testimony would be confirmed by our best men in every branch of trade, where there is scope for genius, I must not digress, and trust you will excuse my hasty protest against this *counterfeit coin*.

I will therefore at once hand you the formula for

COMMON WHITE BUFFER-RINGS AND WASHERS, ETC.

lbs.		d.	s.	d.
Grind 30	Java caoutchouc at	7 ..	17	6
,, 18	oxyde of zinc ... at	3¼ ..	4	10
,, 6	carbonate of magnesia ..... at	4 ..	2	0
,, 6	clean chalk or whiting ..... at		0	1
,, 2	flowers of sulphur		0	3
	Mill-costs on 62 lbs. at	3 ..	15	6
			£2	0 2

or 8d. per lb.; this is sold at 2s. 2d. per lb., and, as you will perceive, contains about 110 per cent. of adulterating matter. [Considering the mass of foreign substances in the above formula (and yet sold under the name of caoutchouc, which should be "pure Java gum" of less than half the density, for a great deal less than 2s. 2d. gross price), one is almost astonished the "gum elastic" should retain any of its original liveliness, mixed up with so much dead weight; but so it is, as I shall show by stating that a buffer-ring (4½×2½×1 ins.) of this quality exactly, and of the same size as those of which I gave the tonnage in your Magazine of the 24th October, indicated, on the same being pressed to half an inch, 4½ tons on the dial. Of course the weight of the ring was fully double those then remarked upon, arising from increased density, by adulteration. Pursuing the same subject of density, I have observed, that these manufacturers have been compelled to charge *less than the actual weight* of their goods, as the people at BERLIN would not pay caoutchouc price for so much rubbish. This was in the "good old red-lead time," when the manufacturers, with more faith than judgment, considered they could not include too much of that metal; but they have since become more crafty and subtle, and use it less madly. I weighed a cylinder or spring some few months since of which a like quality are now in use by the London and North-Western Railway, and, I expect, at their station at Wolverton, which contained at least 100 to 130 per cent. of cheap, heavy adulteration; and yet they paid 1s. 6d. per lb. in quantity net. The size was 6×2½×4, and weighed close upon 6 lbs. I should say, if the charge had been 9d. per lb., no manufacturer could need a better trade; hence I have chosen to throw a little "free-trade light" upon the subject.

The washer trade is a very lucrative one to the manufacturers, being principally cut from the spare or waste ends unavoidable in the make of springs, cylinders, and buffer-rings.

I will now hand you a formula for what is termed

HYPO-CLOTH FOR WATERPROOF COATS, ETC.

lbs.		d.	s.	d.
Grind 30	Clean Java gum at	7 ..	17	6
„ 5	lamp-black ....at	1¼..	0	6
„ 11	dry chalk or whiting .....at		0	2
„ 5	sulphuret of lead at	3¼..	1	4
	Mill-costs on 51 lbs. at	3 ..	12	9
			£1	12	3

or 7½d. per lb. cost.

Sometimes the Para gum is used in this mixture; but, though better, its use is not considered imperative if the Java caoutchouc is well cleansed. A cured coat, well vulcanized, is a great improvement in all respects upon the filthy naphtha or varnish coat, and should, when competition is thrown into the market, exceed it very little in charge. As long as the calico upon which these are run is covered, the thinner that covering the better; and by far the best I have seen are made by Messrs. Mackintosh and Co; Moulton and Co., Bradford, Wiltshire; and Moses, Son, and Davis, of Bow-common. I have seen some very bad ones, both ill-shaped, non-vulcanized, and altogether only useful *in bringing the better make into unjust dislike by the public.* The sooner these latter daubs are improved, or withdrawn from sale, the better for the reputation of the India-rubber garment-dealers.

The cloth upon which the material is spread weighs about four ounces to the yard, and therefore the quantity of gum on each garment is readily assessed, and the scale will determine which are lightest and best for a storm.

The article termed "sulphuret of lead" in the formula, is the chemical I remarked upon in my paper in your Magazine of the 4th October, and the screen or blind nicknamed (*for reasons therein explained*) "hypo," and is only useful in so far as *it is an excellent black pigment*, which is only of importance in the garment branch of the trade.

In my next I will supply you with full particulars of the manufacture of what are styled "hydrostatic water-beds," and "cushions," and "inodorous impermeable sheeting," and the "waterproof bed-slips," of which last-named one firm made twenty thousand for our soldiers in the Crimea during the last war. This, with one other paper, will (I think) conclude my series; and these I will send you in due course, if you will kindly permit space in your unfettered Journal, and these adulterating manufacturers do not cause my head to be taken off in some lonely spot on one of these dark nights. I hope, however, they will be better directed, and feel that I only wish to make them better citizens or countrymen, by removing the "sear" or incrustation that will discover to them a conscience when trading with the human family.

I am, Sir, yours, &c.,

W. H. HERBERT.

Mitcham Common, Oct. 1, 1856.

IS AERIAL NAVIGATION PRACTICABLE?

To the Editor of the Mechanics' Magazine.

SIR,—More than nine years have rolled away since I first had the honour of appearing in the *Mechanics' Magazine* as a propounder of a scheme of aërial navigation. My first essay on this subject appeared in your *Magazine* of June 5, 1847, and was written on April 22, in that year. The plans then proposed were greatly modified in a subsequent communication, sent January 19, 1848, and which appeared in your *Magazine* of the ensuing June 10. A controversy of brief duration arose upon the subject of these communications, in connection with which I wrote some articles in your columns at different dates. Happily I quarrelled with none, and took such information as I could from all. My projects were noticed in other periodicals besides your own, and candour compels me to state that the various critiques were universally of a despairing character, though some little credit was given to me for ingenuity. Since 1848, I have not published any communications on the subject of aërial navigation. But it must not be supposed that I have abandoned my project. During the whole period of nearly ten years, my mind has been directed more or less to this subject. At intervals I have allowed my ideas to take rest, and the intervals have sometimes been rather long, but I have never gone so far as to abandon my schemes. My faith in aërial navigation, and in the main features of my project, has never wavered. My plans have undergone some modification, but the main features are the same as they were in 1848. As some of your readers will perhaps be tempted to refer back to my communication in that year, I should be glad if you would allow me to warn them that fig. 3 should be fig. 4, and *vice versâ*, the printer having made an error on this somewhat important point.

During the years in which I have thus attempted to solve this great mechanical problem, I have endeavoured to find out the principles of aeronautic science; and I can honestly say that I have truly found this to be a voyage of discovery into unknown regions. If there be any science which may be said to be slighted and misunderstood, it is that of aeronautics. In studying this subject, and in advocating its merits, I find myself in the unfortunate position of being involved in the ridicule which a host of mountebanks have brought down upon one of the noblest arts which can occupy the attention of mankind. At this hour, aërial navigation stands identified with the absurdities of metropolitan and Parisian Don Quixotes, who have hazarded life and limb, and in several cases tortured the inferior (?) order of animals, not for the benefit of science, but to abstract the shillings and the francs from a gaping multitude, to whom excitement is pleasure. There was a time when the public sincerely believed in what they called "flying," but their credulity has been so unmercifully practised upon, that having in past times believed in everything, they have come to the conclusion that in regard to all aërial projects it is the safest and most philosophical plan to believe in nothing.

But, sir, I have a faith in this matter, and my works are an evidence that I am in earnest. True, I have not invested a fortune in the undertaking, and that is for the best of reasons. But I have invested brains, and hours, and days, and weeks, and months! If any one could prove to me that my lucubrations were all moonshine, I should feel exceedingly obliged to him, for I should henceforth save myself a considerable amount of nervous energy. Until that proof is afforded me, I feel like one that must go on. It may be said that my plans are not likely to be tried, since I have given them to the public, and have thus prevented all possibility of a patent; but I am prepared to show that this is not the present state of the case. Since I last appeared in print, I have made discoveries which give me the command over the whole invention. What these discoveries or inventions are, I shall hereafter proceed to indicate, that my assertion on this point may not go altogether untested.

In connection with my studies upon this interesting, though neglected, department of science, I have given some outward signs of what I was about. In regard to the general principles, I have spoken pretty freely, nor have I altogether concealed my knowledge—real or imaginary—as to the application of those principles. I have lectured on my favourite theme, and though a prophet has no honour in his own country, yet I have enjoyed attentive audiences in my native town, and have in some cases produced an unexpected impression. In the year 1850, or early in 1851, I commenced a model of my Archimedean balloon, according to the plans published in June, 1848. After many months of occasional working on this model, I completed it, and I believe those who have seen it are not disposed altogether to deride my pretensions as an aërial navigator.

Nor is this the only effort I have made. Conscious of the difficulty as to a proper motive power for the purposes of aërial navigation, I turned my attention some two or three years ago, to the subject of a new

motive engine, and in the course of the year 1855, I suceeeded in making a wooden model, showing the construction and working of an entirely new motive engine, to be worked by a chemical agent. My engine resembles a steam engine, except that the more weighty parts are dispensed with. I have no boiler, no furnace, and no steam-chest. In fact, I have little else than the cylinders and the usual amount of valve gear. The material employed occupies very much less space than coal, and, power for power, will probably cost but little more. The engine itself will be incomparably lighter than the steam-engine, and much less bulky. It would not only be well adapted to the purposes of aërial navigation, but would be of immense value in ocean voyages.

I admit that my engine may be a delusion, and my aërial projects impracticable; but still, my opponents must also admit that although I may be in error, it is also possible that I may be right and they in the wrong. In the first place, I know my own plans better than anybody else can know them: and as to whether my statements are credible, those who know me can say how far my general conduct entitles me to their regard and confidence. If I am reasonable and sound on other topics, why not on this?

I am compelled to speak more of myself than is pleasant or seemly, simply because the projects I advocate have much of the personal element about them. It is very likely that I may be styled vain and egotistical, and perhaps I am; but at least I am honest, and as for any amount of rebuke I may receive, I have this confidence, that the truth will prevail at last, however weak and erring may be its advocate.

With your permission, I will go on with the subject at an early date.

I am, Sir, yours, &c.

JOSEPH PITTER.

254, High-street, Borough, Southwark.

FLYING BY MAN.

To the Editor of the Mechanics' Magazine.

SIR,—WORCESTER in the 77th of his Century of Inventions, asserts that he caused "a boy ten years old to fly from one end of a barn to the other on a hay mow." Let us take nature for our guide, and see if Worcester spoke truth. I measured the extended wing of a fowl, and found its area 50 inches, the weight of fowl being 3 pounds. We will suppose the weight of the boy and his wings 112 pounds, we then get by proportion 3 : 112 :: 50 : 1866, and $\sqrt{1866}=44=3$ feet 8 inches nearly. Thus, *Sir, you see* a pair of square wings, whose sides=3 feet 8 inches would enable the youth to wing his way through the liquid air. It would cause me less wonder to see a man flying, than to think that the suggestion of Worcester has been 200 years before the world, and no person has appeared with energy and ingenuity sufficient to carry it out. Philosophers tell us a man's arms would not be able to bear the weight of wings large enough for his purpose. This indicates the grand mistake: the wings should not be attached to his arms, but to his body, and might be worked by simple mechanism.

I am, Sir, yours, &c.,

WM. CARROLL.

Openshaw, Manchester.

To the Editor of the Mechanics' Magazine.

SIR,—I sincerely wish that when correspondents make affirmations they would also give some proof by way of substantiating them. If this were done what time and space might be saved, and errors foreseen!

Now, Mr. Baddeley in remarking upon my letter on this subject, says, "the rotation of the vanes will, after a short time, be inevitably communicated to the whole of the apparatus, &c." All of which is mere assertion and not worth a straw; for if attention is to be paid to such, I may in like manner throw cold water upon the invention of any one.

With regard to the apparatus being at the mercy of the winds, I think that at any rate it could be controlled as well as ordinary balloons are, for when a vertical sail is added, which should be so arranged as to be put into connection with the wheelwork on the vertical shaft, and disconnected from it when necessary, the business of steering through the air would become comparatively simple.

It is almost needless to state, that in ascending, the vertical sail should be disconnected, and when the desired height is attained, it should be connected, to the end that the operator may be enabled (not however without experience) to glide through the air in any direction, and reach any desired situation.

I wish, with Dr. Lotsky and Mr. Baddeley, that we had more able inventors, more heroes and willing men, who would take these things into their hands.

I am, Sir, yours, &c.

A DUBIOUS READER.

FACTS AND FANCIES.

To the Editor of the Mechanics' Magazine.

SIR,—If "Disciple" ties a string to a piece of iron, and lets a weight at the other end of the string hang over the edge of the table, he will doubtless find (as he states) that the weight, if sufficiently heavy, will draw the iron along the table. He goes on to observe, that if he places a magnet in a certain position on the table, the weight will not move the iron, but the entire apparatus will remain stationary. He next inquires what he is to say to a bystander who asks him *why* the iron no longer moves? "Disciple" then comes to me for the answer. But my response is this—I am simply desirous that the *fact* should be clearly and correctly stated, and that the theory should be kept distinct. "Disciple" has stated his fact, and he may account for it as he pleases. With certain arrangements the iron approaches the magnet. With certain other arrangements the apparatus remains stationary.

As for the word "approachtion," I fancy that "Disciple" will find less difficulty on the score of language than he anticipates.

In regard to the obnoxious "bog gas," I will give "Disciple" a sincere answer when he puts a sincere question.

I am, Sir, yours, &c.,

J. PITTER.

254, High-street, Borough, Southwark,
Nov. 29, 1856.

DR. LARDNER'S INVESTIGATIONS.

To the Editor of the Mechanics' Magazine.

SIR,—I have no intention of entering into a lengthened controversy with Mr. Good, my object in noticing his "little discoveries" having been fully gained. Dr. Lardner deservedly stands too high as a man of science to require any further discussion as to whether the absurdities attributed to him by Mr. Good are the true scope of his explanation, or only the misapprehension of the latter gentleman. I can also well afford to rest contented under the sarcastic notice of my logical powers by such an acute reasoner and appreciator of the true meaning of mathematical symbols as Mr. Good has shown himself, in not discriminating between an "argument" and a mere illustration of fundamental notions, with which latter object alone were my symbols introduced. If Mr. Good is not acquainted with these notions and the mode of representing them by symbols, it is no fault of mine.

That gentleman's little discoveries, which you have thought worthy of a place in your magazine, would have received no notice from me but for the bearing they have upon the controversy with regard to the moon's rotation. That question has now been well ventilated, and may well be left to the decision of time. The little discoveries of half-fledged mathematicians, and the authoritative dicta of such men as Mr. D. Mushet, who are ready to pronounce an opinion *ex cathedrâ* on any subject, generally the more positive in proportion to their ignorance, may for a season obtain for the heresy of Mr. Symons a degree of support which it does not deserve. The time, however, will undoubtedly arrive when it will be remembered with wonder that in the nineteenth century, basking in the full sunshine of science, men were found foolish enough to deny the moon's rotation, and others foolish enough to believe them.

I am, Sir, yours, &c.,

A LOOKER ON.

SOLDER FOR ALUMINIUM.

To the Editor of the Mechanics' Magazine.

SIR,—Having made preparations for making artificial palates of Aluminium, I shall feel obliged if any of your scientific correspondents will inform me of the best description of solder for that metal, and the most appropriate method of using it.

I am, Sir, yours, &c.,

GEORGE HAYES.

Condult-street, Regent-street.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

PULS, F. *Improvements in galvanic batteries.* Dated Mar. 29, 1856. (No. 755.)

This invention consists in employing, in place of the zinc or other metal commonly employed for galvanic batteries, materials of a cheaper description (such as iron cast or wrought) in conjunction with carbon, in which case the cast or wrought iron forms the positive pole, and black pottery, or graphite, or any other description of carbon or coal the negative pole.

RIPPON, J. J. *An improvement or improvements in rollers or cylinders for printing fabrics.* Dated Mar. 29, 1856. (No. 756.)

The patentee makes a core or hollow cylinder of metal, of less external diameter than that of the roller or cylinder to be manufactured. The interior of the core is of a size proper to receive the axis. He places the core in a mould and casts on it a casing of copper. He makes projections on the core, or indentions therein, so that the casing of copper shall not be liable to be detached during the finish of the roller, or in using it.

EIVES, J. *A new mode of preparing fibres from plants.* (A communication.) Dated Mar. 29, 1856. (No. 758.)

The inventor cuts the plants near the ground, and sets the plants in a pit with their buts downward, as soon as they are cut, as near together and as nearly in a vertical position as possible. When the pit is quite full he covers its sides with leaves or straw, and embanks them with earth several inches thick and as high as the tops of the plants. The sun and air being thus excluded, the gases of the plants are slowly evolved, and replaced by the moisture from the earth, which penetrates the stalks, and destroys the glutinous portion, causing the fibre to separate from the woody substance. When the process is completed, the pit is broken up and the plants spread out to dry. When dry the woody portion is detached by passing the plants between rollers, or under beaters.

MUSCHAMP, W. *An improvement in the manufacture of paper, in order to render the same waterproof.* Dated Mar. 29, 1856. (No. 759.)

Soap (good white soap) is dissolved in pure water and boiled; alum, and glue, and gum arabic are also dissolved in water. These solutions are mixed together, and the paper is saturated therewith, and then pressed between rolls and dried in the ordnary manner.

PENRICE, H. N. *Improvements in machinery for driving galleries through rock and other strata.* Dated Mar. 29, 1856. (No. 760.)

This invention consists in machinery for jumping or chipping a cylindrical hole or gallery through rock or other strata by means of chisels or points fixed in a frame on the end of a shaft, which is drawn backwards and forwards by steam or other power, and which revolves a little between each stroke.

MCLEAN, J. *Improvements in treating or preparing textile fabrics and materials for increasing the density thereof.* Dated Mar. 29, 1856. (No. 761.)

This invention relates to the use of a solution of a salt of barium, strontium, or calcium, for increasing the density of materials, and improving the appearance thereof.

NORMAND, C. B. *Improvements in steam boilers, in apparatus for applying heat to steam boilers, and economizing heat of furnaces.* Dated Mar. 29, 1856. (No 762.)

This invention will shortly be described.

NIMMO, W. *Improvements in the manufacture of textile fabrics.* Dated Mar. 29, 1856. (No. 763.)

The object here is the production of fabrics, soft or spongy to the touch, and *applicable* particularly to such goods as Zebras, or Fermaish shawls, or imitations thereof. According to one method, the patentee so conducts the weaving that on one surface there is a figure more or less raised, and on the other surface the appearance of the back or loose side of the "Zebra," or imitations thereof, is retained upon the raised or figured side. He prints according to the usual methods. Further he so weaves a fabric that the weft threads become flushed or thrown upon each side thereof, the warp being in greater part contained between the two surfaces, thus producing a cloth having the appearance of a satteen on both sides, with the soft, spongy texture required. He prints a pattern in the usual way on each side of the fabric without one colour or pattern interfering with the others. This cloth has the appearance of costly Fermaish shawls.

GARDISSAL, C. D. *Certain improvements in steam boilers.* (A communication.) Dated Mar. 29, 1856. (No. 764.)

This invention consists—1. In a certain arrangement of a fire-chamber and water casing, the upper horizontal sections of both of which are greater than their lower horizontal sections, in combination with a series of descending flues by means of which the products of combustion are conveyed downwards to be thence discharged into the chimney. 2. In graduating the openings in the tops of the flues or tubes, which may be done by gradually diminishing the diameters from those nearest the fire-box or furnace to those most remote from it. 3. In inclining the descending flues or tubes both ways from the centre laterally, and also inclining the flue plates or sheets in which they are riveted so as to form a space central between the tubes, in which the sediment may deposit, and from which it may be removed readily, and for the further purpose of having the flue sheets or plates square with the tube to facilitate their being properly riveted therein.

GUIDO, A. *Improvements in cleansing, washing, scouring wool and woollen fabrics and yarns.* Dated Mar. 29, 1856. (No. 765.)

The patentee describes a powder, which he calls "Panama Powder," two parts of which consist of—Caustic lye, 20 parts; soft soap, 4 parts; Marseilles soap, 2 parts; Panama, 4; soap wort, 2; soda salt, 68. This compound, after being reduced for two hours in a boiler over the fire, is laid on a suitable plate, till it is completely dried.

GARDISSAL, C. D. *An improvement in screw stop-valves.* (A communication.) Dated Mar. 29, 1856. (No. 767.)

This invention consists in making the screw on a shell that is attached to the spindle in such a way that it can be readily

removed to allow of the grinding of the valve.

GARDISSAL, C. D. *Certain improvements in machinery for sweeping streets and other ways.* (A communication.) Dated Mar. 29, 1856. (No. 768.)

This invention consists—1. In the employment of reciprocating brooms. 2. In the employment of an endless apron working transversely or laterally to the direction in which the machine travels, for conveying the dirt swept upon it by the brooms from under the machine, and depositing it in rows, &c.

HICKS, J. *Improvements in stoves.* Dated Mar. 31, 1856. (No. 769.)

In one mode of constructing the improved stoves a hot chamber is formed within the whole length of the body of the stove. The fuel box is so suspended in the centre of the outer case that the fresh air, coming through an aperture in the base of the stove, passes up between the fuel box and outer case, discharging itself pure, fresh, and hot at the top.

LOOKER, B., jun. *An improved mark or indicator to be let or fixed into the ground in burial-grounds and other places.* Dated Mar. 31, 1856. (No. 770.)

The patentee makes his improved marks closed or solid at the top, and made to slope downwards, so that any words, letters, or figures upon the sloping part may be easily perceived.

HAICHOIS, C. J. LE M. DE LA. *Certain improvements in paving.* Dated Mar. 31, 1856. (No. 771.)

In carrying out this invention a layer of lime and sand is laid down to the thickness of about five inches. Then a layer of asphalte mixed with stones of about two inches is applied; after which a layer of asphalte (either alone or mixed with sand) of about one inch is laid down, and in these are imbedded, at equal distances, strips or bands of vulcanised caoutchouc or gutta percha. In the last application a layer of asphalte, about half an inch in depth, is first laid down, and afterwards the strips or bands of vulcanised caoutchouc or gutta percha, about half an inch in thickness, and from a half to three quarters of an inch in breadth, so as to form squares or lozenges. The strips are placed from six to ten inches apart, and are secured together by iron hooks or ties at a distance of from three to five inches from each other, which hooks pass through them. Instead of using hooks, the strips may be bevelled at the edges so as to be firmly imbedded in the asphalte. When the strips are down a second layer of asphalte is applied so as to be on a level with the strips of caoutchouc.

HENDERSON, H. *Improvements in stop-cocks or valves.* Dated Mar. 31, 1856. (No. 772.)

This invention consists in so constructing stop-cocks or valves as to insure more complete lightness and accuracy of working than hitherto, and dispensing with the necessity of grinding up conical surfaces as in the common stop-cock. The invention may be carried out under various forms.

BURRELL, T. W. *Improvements in machinery for obtaining power by water.* (A communication.) Dated Mar. 31, 1856. (No. 775.)

The object here is to regulate the openings for the flow and stoppage of water in turbines. The principle on which the new system is founded consists in opening or shutting the various compartments of the water escapements independently of each other; hence as many openings may be closed as may be considered necessary to correspond with the volume of water to be supplied, and at any time a greater or less number can be closed.

CORNFORTH, H. *A new or improved manufacture of plated tea-pots, and coffee-pots, and other vessels and articles of like manufacture.* Dated Mar. 31, 1856. (No. 776.)

This invention consists in manufacturing tea-pots, coffee-pots, and the articles of like manufacture, of zinc, plated or coated with silver by the ordinary electro-metallurgical processes.

SMITH, G. T., and J. WATTS. *An improved lubricator.* Dated Mar. 31, 1856. (No. 778.)

The characteristic feature of this invention is the employment of a plunger in a tube formed with holes at the upper end. The oil is injected by striking a sharp blow on the top of the plunger, by which the plunger will cover the holes in the tube, open a valve, and force out the oil.

NEWTON, A. V. *Improved machinery for folding paper.* (A communication.) Dated Mar. 31, 1856. (No. 779.)

This machinery cannot be described without illustrations.

BENTLEY, J. *Improvements in breech-loading fire-arms, and in the cartridges to be used therewith.* Dated Apr. 1, 1856. (No. 780.)

This invention is applicable to small breech-loading fire-arms, and consists of mechanical arrangements by which the barrels can be drawn to or advanced from the breech in a direct line parallel to the bore of the barrel, and by which the barrel can be held securely fixed in close contact with the breech; and an improved arrangement for a lock applicable to repeating fire-arms; also an improved cartridge for breech-loading small arms.

BAPTISTE, C. *Improvements in machine for manufacturing tenons and mortices* (Partly a communication.) Dated Apr. 1, 1856. (No. 781.)

These machines cannot be described without illustrations.

LAPORTE, E. *The application of certain new materials in the manufacture of bougies, candles, and other similar articles.* Dated Apr. 1, 1856. (No. 785.)

The patentee employs certain oleaginous grain or seeds, one of which is found at Gabin, on the west coast of Africa, and is called "Dikha;" another is called "Virola Selifera," a tree of the family of Myristicus, which is also found in Guiana and in Cayenne.

GRAY, J. *Improvements in steam boilers, furnaces, and fire-bars.* Dated Apr. 1, 1856. (No. 786.)

Claims—1. Constructing steam boilers with tubular flues, having a series of chambers of spherical or other suitable form in their upper surfaces, as described. 2. Constructing fire-bars with diagonal channels in their upper surfaces, as described. 3. Constructing fire-bars with diagonal channels in their upper surfaces, and with their back ends inclined or bent as described. 4. Constructing furnaces with fire-bars having diagonal channels in their upper surfaces, and with their back ends inclined or bent, as described, and so placed that the back ends may incline upwards, and come in contact with, or in proximity to, the bridge of the furnace. 5. Constructing furnaces with moveable blocks, or blocks fitted into frames fixed into the brickwork or masonry of the furnace, and which blocks or checks are capable of being readily drawn out and replaced by others, as described.

NEWTON, A. V. *Improved apparatus for ascertaining gradients.* (A communication.) Dated Apr. 1, 1856. (No. 787.)

This invention consists in transmitting motion to an indicating apparatus from a waggon wheel or axle through the agency of cones, which convey to friction wheels, with which the indicating apparatus is provided, a graduated motion, regulated by a pendulum.

ROBERTS, W. *Improvements in the construction of pumps.* Dated Apr. 1, 1856. (No. 788.)

In this invention, two or more double-acting pumps are combined, so as to obtain compactness of structure with ready access to the valves, and a small number of parts. In a pump of two barrels or cylinders with the requisite valve box between them, the two cylinders are produced in one casting, combined by the valve box. The base plate is made in one casting, having through it the inlet passage. The cylinders have separate covers, and so has the top of the valve box. The two piston rods are actuated either by a rocking lever or by a crank shaft or axis.

GRICE, F. *New or improved machinery for the manufacture of bolts, rivets, spikes, screw blanks, and nuts.* Dated Apr. 2, 1856. (No. 790.)

This machinery cannot be described without illustrations.

YOUNG, F. *An improved two-wheeled open vehicle or carriage.* Dated Apr. 2, 1856 (No. 791.)

This invention consists—1. In arranging the seats in the body of the carriage across the back and front, the back seat being of two parts, one fixed, and the other attached to it by hinges. 2. In adapting to the front a seat for a driver, which can be removed when not required. 3. In adapting also to the front a rein bearer to be used when the driver sits inside. 4. In placing the door in the back on one side, occupying half the back. 5. In placing the shafts higher than usual in vehicles drawn by one horse. 6. In a contrivance by which the door is fastened by the hinged seat being placed in position.

ROBERTS, R. *Improvements in omnibuses and other passenger carriages.* Dated Apr. 2, 1856. (No. 792.)

The invention consists—1. In jointing the fore axle to a vertical pin on which it swivels. 2. In supporting the fore end of carriage bodies on springs resting on the swivel pin. 3. In contracting the gauge of the fore wheels, to enable them to work between the bottom side beams of the carriage, and to allow of steps being placed outside the wheels conveniently. 4. In widening the central portion of the roof so as to admit a passage between the persons on each side of it, and in the application of a hand rail at each side of the passage. 5. In causing the covering boards of the outer portions of the roof to project beyond the sides to afford room for the feet. 6. In extending the lower portion of the risers beyond the body for supporting the canopy and foot step, and in constructing the guard's canopy to form a communication between the sides of the roof. 7. In placing the fulcrum of the brakes further than usual from the circumference of the wheels.

M'GREGOR, P., and T. MARQUIS. *Certain improvements in the machines for spinning called throstles.* Dated Apr. 2, 1856. (No. 793.)

This invention consists—1. In giving a longitudinal to-and-fro motion to a rail covered with flannel (or other material), on which the bobbins are supported, for producing a uniform friction between the bobbin and the flannel. 2. In driving the spindles by means of bands passing round vertical drums driven by a horizontal shaft and gearing.

COTTRILL, J. S. *Improvements in presses.* Dated Apr. 2, 1856. (No. 794.)

The patentee, in applying hydraulic

power, fixes a strong frame, and within it arranges another with strong head and foot cross-pieces. Between these cross-pieces he places the goods to be pressed, and causes a follower or cross-bar to fall and rise in a slot in the sides of the vertical frame, and by means of racks and pinions worked by wheel gearing he causes the follower or cross-bar to descend, and thus press the goods.

GALLOWAY, G. B. *Improvements in propelling vessels.* Dated Apr. 2, 1856. (No. 796.)

This invention consists in combining the paddle wheel, the screw propeller, and the expulsion of air and water for the propulsion of vessels; also in the use of the expulsion of air and water as a separate means of propelling vessels on rivers and canals, and also in the combination for such purpose of the screw propeller and the expulsion of air and water.

GWYNNE, G. *Improvements in treating fatty, oily, and greasy bodies.* Dated Apr. 2, 1856. (No. 798.)

The invention consists—1. In the decomposition of tallow, lard, palm oil, and mutton suet into fatty acids and glycerine by the action of steam at temperatures below the degrees of heat at which the fatty acids and the glycerine distil over in a mixed but uncombined state. 2. In the decomposition of these substances into fatty acids and glycerine by the action of water at temperatures below 340° Fahr. 3. In the use of mechanical agitators when distilling fatty and oily bodies.

HINE, G. H. *Improvements in children's and invalids' carriages called perambulators.* Dated Apr. 2, 1856. (No. 799.)

The body of the carriage is made to separate from the frame and wheels, and is of a form suitable to be used separately as a chair. The handle is in connection with breaks to act on the hinder wheels, or otherwise to stop the carriage, whenever the handle is not pressed forward.

SAMUEL, J., and J. NICHOLSON. *Improvements in steam and other vapour engines.* Dated Apr. 2, 1856. (No. 801.)

This invention was described and illustrated at page 361, of No. 1732.

NEWTON, A. V. *Improvements in the construction of rotary steam engines, applicable in part to pumps for raising and forcing fluids.* (A communication.) Dated April 2, 1856. (No. 802.)

This invention relates to a mode of combining in the same engine the rotary and oscillating principles.

WHITE, T., jun. *Improvements in slips and ways for receiving ships or vessels requiring repair, and for apparatus to be used for hauling up ships or vessels.* Dated Apr. 3, 1856. (No. 808.)

This invention was described at page 371, of No. 1732.

KITSON, F. W. *Improvements in the manufacture of railway wheels.* Dated Apr. 3, 1856. (No. 809.)

This invention relates—1. To railway wheels constructed on the L spoke plan, in which one spoke and one adjacent segment of the rim or felloe are formed of one bar of iron, bent similar to the letter L, the outer or rim end of one bar being then welded to the angle or bend of the next bar. The patentee thickens the spoke bar, or forms a protuberance on it at the part which forms the bend or angle, for the purpose of supplying the diminution by bending and welding, and of enabling the junctions to be made strong; the ends of the bars to be welded to the angle may also be thickened if desired. 2. To wheels having cast-iron naves and wrought-iron spokes, and consists in securing the spoke bars into the nave, by forming projections, fins, or indentations on the spoke bars, during the rolling of the bars, by which means a holding for the cast metal is got better, and at less expense than by hand labour. 3. To the formation of wrought-iron naves of railway wheels. The usual plan consists in forming the spoke bars with greatly enlarged inner ends, to constitute, when put together, a complete circular mass, ready to be welded into a boss or nave. Instead of this the patentee allows the spoke ends to remain nearly similar to the rest of the bar, and completes the required circular mass by inserting separate pieces of iron between them, the spoke bars being so formed as to lock these pieces in place during the welding.

BANNEHR, J. *An improvement in manufacturing or preparing paper for, and in mounting copies of, written documents thereon.* Dated Apr. 3, 1856. (No. 811.)

The object here is to render useful the copies of written documents, obtained by copying presses, &c., by providing a prepared paper fit for mounting, and in mounting such copies on either or both sides thereof.

HALLIWELL, R. *Certain improvements in the machines for spinning called self-acting mules.* (A communication.) Dated Apr. 4, 1856. (No. 814.)

This invention consists in an improved combination of parts for regulating the lifting of the copping faller when the carriage arrives at or near the drawing rollers.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

GARDISSAL, C. D. *A new compound of inflammable materials for the purpose of lighting fires in grates, stoves, furnaces, or other*

fire-places. (A communication.) Dated Mar. 29, 1856. (No. 766.)

The inventor takes white turpentine, 16 parts: gum olibanum, 1 part; gum camphor, 1 part; powdered charcoal, 8 parts. In a heated vessel, he first places the white turpentine, which is allowed to melt; he then adds the gum olibanum and gum camphor, reduced as nearly as possible to powder. After these have been dissolved, he adds the powdered charcoal, and stirs the whole together. The compound at this stage is a pasty mass, and he moulds it into any convenient form. When cool it is hard and solid.

PARKER, C. *Improvements in machinery or apparatus for winding yarns or threads.* Dated Mar. 31, 1856. (No. 773.)

The essential object of these improvements is the attainment of an uniform take-up of the yarn or thread as it is wound into the required form, and the invention is applicable to machines having either horizontal or vertical spindles.

BIRD, G. *Improvements in the application of asphaltic or bituminous compositions for building and structural purposes.* Dated Mar. 31, 1856. (No. 774.)

This invention relates particularly to the copings, cornices, or coverings of walls, and other erections. In applying the invention, the asphalte, or asphaltic composition, is cast or moulded in blocks of the required form or section, and the coping blocks so made are built together upon the wall to be covered and finished, just as stone coping is at present applied.

PRINCE, A. *Improvements in steel pens, for regulating the elasticity thereof.* (A communication.) Dated Mar. 31, 1856. (No. 777.)

These improvements consist in adapting a spring to the upper or outer surface of metallic pens—1. For keeping the nibs; and, 2. For insuring a supply of ink thereto.

ASHTON, J. *Improvements in machinery or apparatus for bruising or breaking grain or other matters preparatory to grinding.* Dated Apr. 1, 1856. (No. 782.)

The inventor uses an additional pair of stones fixed horizontally above the ordinary stones, each stone being secured in a metal casing, and connected to the main spindle by an additional spindle upon which the lower stone and casing, being fastened by keys, revolve at the same speed as the ordinary stones, &c.

SOUTHAM, A., S. STEAD, and J. MARTIN. *Separating or recovering the vegetable substances from mixed fabrics, and rendering the same vegetable substances again available for manufacturing purposes.* Dated Apr. 1, 1856. *(No. 783.)*

A boiling solution of pearl ash, American ash, potash, or other suitable chemical is made, and the woven fabrics are introduced therein, and after sufficient immersion, withdrawn and passed between squeezing rollers, and subsequently washed in pure water and dried. The vegetable fibre will be then found to be entirely divested of all traces of the wool or animal fibre.

HERBELOT, A. L. A. *A new method of obtaining a continual motive power.* Dated Apr. 1, 1856. (No. 784.)

Compressed air or other gas, or a fluid, is introduced into an air-tight case, which contains a shaft that has a helix or thread of uniform breadth and thickness. The gas or fluid, by exerting unbalanced pressures on abutments communicates rotary motion to the aforesaid shaft, and by it to an external shaft, by which machinery may be driven.

PATERSON, J. *Improvements in the manufacture of paper.* (Dated Apr. 1, 1856. (No. 789.)

These improvements refer to the primary disintegration of the rags or raw materials, the washing or boiling process, and the bleaching of the pulp. The assorted rags are first deposited for a few hours in an acidulous solution, and then removed and placed in a machine consisting of a receiver with a flat metal corrugated bottom, upon which there rests a corrugated metal roller, which is traversed back and forwards over the rags. The materials are next boiled in a boiler containing a mechanical agitator. The boiler is a vertical cylinder, and steam is supplied to it from above through a vertical rotating pipe. Hollow branch arms are fitted to this pipe, and these arms have steam jet orifices in them. When at work the steam is passed in amongst the materials through these jet branches, whilst the latter at the same time rotate, and aid the effect. After this the reduced mass is deposited for a short time in an acidulous solution, and then finally bleached.

ELLIS, C. *Certain improvements in machinery or apparatus for spinning and doubling cotton and other fibrous substances.* Dated Apr. 2, 1856. (No. 795.)

This invention applies to throstles, being also applicable to ordinary doubling frames or machines, and consist in giving a short reciprocating traversing motion to the drag-cloth upon which the bobbins revolve.

BONNARD, L. *Improvements in collapsible or folding hats and bonnets, and in flexible articles to be applied to other coverings for the head.* (A communication.) Dated Apr. 2, 1856. (No. 797.)

This invention consists—1. In constructing a hat or bonnet with a number of strips of whalebone (or other material) in casings

of the soft material of the article. The brim and body have a separation on one side, from which the brim closes and opens in the manner of a fan. 2. In the application of a flexible brim, with its radial stiffenings of whalebone, to a man's hat as a sun shade.

SMITH, H. *Apparatus for cleaning and polishing boots and shoes.* Dated Apr. 2, 1856. (No. 800.)

This invention consists in fixing brushes upon a shaft, and in communicating rotary motion thereto through wheel-work. The brushes are fitted in a case, and openings are provided for the insertion of the boot or shoe to be cleaned.

JENKINS, W. *A new and improved method of manufacturing copper rollers for calico printing.* Dated Apr. 3, 1856. (No. 803.)

A wheel or cake of copper, of suitable dimensions, is rolled or hammered until the metal is rendered sufficiently dense for the surface required to be afterwards produced upon it, and is then to be bent by rollers, or otherwise, into a cylindrical form, the edges being unjoined. The edges are to be joined, and the cylinder made complete by melted metal poured upon and between them until they are fused.

PONTIFEX, E. A., and W. NEEDHAM. *Improvements in the manufacture of preparations or primings used for preparing canvass, wood, or other material for the reception of pigments or colours.* Dated Apr. 3, 1856. (No. 804.)

The inventors propose to take the spent wash of distilleries, brewers' yeast or grounds, or the resinous or glutinous matter produced in the preparation of flax, either separately or in combination, and after discharging impurities therefrom, to use the liquid or semi-liquid obtained with white or red lead, or other ingredients ordinarily used for first coatings.

SMITH, C. C. *A new or improved method of working brakes for stopping machinery used for raising coals and minerals, and for stopping steam engines and other motive power engines.* Dated Apr. 3, 1856. (No. 805.)

At the end of the long arm of the lever which works the brake a vessel is hung, and over the vessel a reservoir of water is placed, or a pipe from a distant reservoir or boiler opens into the vessel. A valve or cock opens and closes the reservoir. When the attendant at the engine sees danger, by a momentary act he opens the valve or cock and lets the water into the vessel hung on the lever. The vessel as it fills depresses the lever gradually, and brings the machinery to rest without shock.

BILLINTON, W. *Improvements in strengthening and preserving wood and timber.* Dated Apr. 3, 1856. (No. 806.)

This invention consists in exerting mechanical pressure endwise of the grain or fibre of the wood or timber.

ABRAHAM, H. R. *Improvements in passenger, exhibition, or delivery tickets, or checks, and in the method of indicating and recording passenger traffic, or delivery of goods, and in the machines used as tell-tales for such purposes.* Dated Apr. 3, 1856. (No. 807.)

The inventor describes certain tickets, to serve several occasions, which tickets are subdivided by lines or marks into a number of compartments concordant with that of the journeys, times, passes, or deliveries it is to denote. The improvement in tell-tales for counting the passing by of persons is that of causing the passenger to displace by machinery balls or pellets which fall into a receiver.

PROVISIONAL PROTECTIONS.

Dated October 15, 1856.

2406. George Guillaume, of Southampton, architect. An apparatus for obtaining motive power, by means of water or other fluid.

Dated October 31, 1856.

2558. Benjamin Goodfellow, of Hyde, Chester, engineer. Certain improvements in the construction of steam boilers, and in the mode of supporting steam-boilers on their seatings.

Dated November 12, 1856.

2658. John Patterson, of Beverley, York, engineer. Improvements in apparatus for churning, which apparatus is also applicable to the washing of roots and other substances.

2660. George Islington Bache, of Glasgow, glass manufacturer. Improvements in lamps and apparatus for affording or supplying artificial light.

2662. Joseph Eccles, of Blackburn, Lancaster, cotton manufacturer. Improvements in machinery for making bricks, tiles, pipes, and other articles made of plastic materials.

2664. William Henry Balmain, of St. Helen's, Lancaster, manufacturing chemist, and Thomas Colby, of St. Helen's, manufacturing chemist. Improved means of grinding various substances.

2666. James Apperly, cloth manufacturer, and William Clissold, engineer, both of Dudbridge, Gloucester. Improved apparatus for condensing wool, cotton, and other fibrous substances.

2668. Richard Archibald Brooman, of 166, Fleet-street, patent agent. Improvements in the preparation of fibres for spinning, and in machinery employed therein. A communication from H. Hofer.

2670. Frank James Wilson Packman, of Puckeridge, Herts, doctor of medicine, and Charles Frederick Pike, of Oxford-street, gentleman. An armed glove or covering for the thumb and fingers.

Dated November 13, 1856.

2672. John Henry Johnson, of Lincoln's-inn-fields, gentleman. Improvements in machinery or apparatus for cutting and folding paper. A communication.

2674. Charles Wastell Dixey, of New Bond-street, optician. Improvements in double opera glasses, and other glasses of a similar nature.

2676. Thomas Stephen Holt, of Manchester, engineer, and Edward Earnshaw and James Barlow, of Rochdale, boiler makers. Improvements in certain parts of steam engines, steam boilers, and apparatus connected therewith.

2678. Thomas Earp, of Newark-on-Trent, wine merchant. A tap for measuring liquids.

2680. John Kinniburgh, Renfrew, N.B., foundry manager. Improvements in moulding or shaping metals.

Dated November 14, 1856.

2682. Peter Armand Lecomte de Fontainemoreau, of Rue de l'Echiquier, Paris. An improved method of forming letters and other devices on metallic surfaces. A communication.

2683. Joseph Hacking, of Bury, Lancaster, machine maker. Certain improvements in machinery for dressing, polishing, and finishing threads and yarns.

2684. Thomas Beatt Sharp, of Manchester, engineer, and Joseph Anthony Collet, of the same place, mechanical draughtsman. Certain improvements in locomotive steam engines.

2685. Adolphe Emanuel Huart, of Southampton, Surrey, jeweller. An improved toy for the use of children.

2686. Richard Emery, of King-street, St. James's-square. Improvements in springs for carriages and other vehicles.

2687. Richard Emery, of King-street, St. James's-square, gentleman. Improvements in the construction of axles and boxes of carriages for common roads.

2688. John Rock Day, of Birmingham, machinist, and Thomas Rutter, of Birmingham, manufacturer. A new or improved metallic tile for roofing or covering buildings.

2689. Edward Money, of St. James's-square, esquire. An improved artificial manure.

2690. Jean Baptiste Heu, of Rue St. Lazare, Paris. Improvements in preserving animal and vegetable substances suitable for food. A communication.

2691. John Sutherland, of Paddington. An improved railway break.

2692. Henry Clarke Ash, of Park-place, South Chelsea. Improvements in railway signals.

2693. Dan Saul, of Swinton, Lancaster, cotton-spinner, and Peter Williams, of the same place, manager. Certain improvements in machinery or apparatus for spinning and doubling cotton and other fibrous materials.

2694. Andrew Symington, of Kettle, Fife, watchmaker. Improvements in apparatus for drying yarns and woven fabrics.

2695. Christopher Binks, of London. Improvements in converting iron into steel, and in giving a coating of steel to iron."

2696. Archibald Reid, of Sidmouth-street, Regent-square, mineralogist, and Charles O'Neil, of Golden-square. Improvements in treating metallic ores to obtain copper.

2697. John Crawley, of Wood-street, Cheapside, collar manufacturer. Improved machinery for stitching fabrics.

2698. James Greaves, of Gerrard-street, Soho, saddle-tree manufacturer. An improved construction of ladies' side-saddle. A communication.

2699. John Aitken, of Islington, gentleman. Improvements in the furnaces employed in the manufacture of iron or other metals.

Dated November 15, 1856.

2700. Nicolas Pierre Joseph Leseure, of Rue de l'Echiquier, Paris, gentleman. An improved *embroidering machine*.

2701. Henry Hawes Fox, of College-hill, *London. Improvements* in manufacturing brushes.

2702. Deane John Hoare, of Mortimer-street, Cavendish-square, gentleman. Improvements in the manufacture of iron.

2703. Robert Mushet, of Coleford, Gloucester, metallurgist. Improvements in the manufacture of iron.

2704. Andrew Barclay, of Kilmarnock, Ayr, engineer. Improvements in the manufacture of iron.

2705. George Davies, of Serle-street, Lincoln's-inn, civil engineer. An improved paper suitable for the filtration of liquids, the dressing of wounds, and for the manufacture of envelopes, bags, bands, and for other similar purposes. A communication.

2706. John Billing, of Abingdon-street, Westminster, architect. Improvements in chimneys.

2707. George Pye, of Ipswich. An improvement in treating and bleaching cotton.

2708. Henry Blackburn, of Butterworth Hall, near Rochdale, Lancaster, manager. Improvements in billies and mules for slubbing and spinning wool, cotton, or other fibrous materials.

2709. John Drew, of Back Hill, Middlesex, cabinet maker. Improvements in library tables or desks.

2710. Nathan Robinson, overlooker, John Lister, mechanic, and Henry Stevenson, pattern maker, all of Bradford, York. Improvements in looms for weaving.

2711. Christopher Binks, of London. Improvements in the manufacture of iron and steel.

Dated November 17, 1856.

2712. Thomas Cope, of Liverpool, cigar manufacturer. Improvements in tobacco cutting machines.

2713. Alexandre Marie Joseph Eeckman, of Lille, France, gentleman. A mechanical bakery and cookery.

2714. Joseph Worthington, of Manchester. An improved mode of signalling from the guard to the engine driver on railway trains.

2715. Constantin Michel, of Lyons, and Isidore Antoine Maret, of Paris. Making atmospherical observations.

2716. William Hawkes, of Birmingham, manufacturer. New or improved machinery for applying steam power to the ploughing of land and other agricultural operations.

2717. Esteves Blanchon, of Blois, France, gentleman. Machinery and apparatus for marking and boring leather and other similar substances, for making and cutting screwed pins, and for uniting leather and other similar materials. A communication.

2718. George Jones and Joseph Reece Jones, of Liverpool, [illegible] builders. An improved life-boat.

Dated November 18, 1856.

2719. John Wilson, of West Bromwich, Stafford, manufacturer. Improvements in springs for railway and other carriages.

2721. Samuel Cunliffe Lister, of Manningham, York. Improvements in spinning.

2722. Frederick Arthur Magnay, of Taverham Mills, Norwich. Improvements in damping paper for printing.

2723. Richard Butterworth, of Chelsea. Improvements in the means of securing the ends of rails for railways.

2724. Samuel Dyer, of Bristol, ship owner. Improved mechanism, applicable to propelling ships, and vessels, applicable also as power machinery for ships' purposes.

2725. John Grieve, of Bank-park, Haddington, colliery proprietor and fire clay manufacturer. Improvements in chimney cans.

2726. Henry Bessemer, of Queen-street-place, New Cannon-street. Improvements in the manufacture of iron.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," December 2nd, 1856.)

1690. W. Leuchars. Improvements in locks for travelling bags.

1708. W. A. Jump. Improvements in apparatus for supplying with fuel the furnaces of steam boilers and other furnaces, and in the method of cleaning the fire-bars thereof.

1719. J. Clark. Improvements in the manufacture of waterproof fabrics.

1722. F. Simpson. An improved mode of stopping bottles.

1723. M. Vergnes. Improvements in electro-galvanic machines for producing motion by galvanic electricity.

1734. H. Hindle. Improvements in valves and apparatus for governing steam engines, and for increasing the safety of steam boilers.

1737. J. Clark. Improvements in the manufacture of beds, mattresses, cushions, and seats.

1741. F. Potts. Certain improvements in tags for stay and other laces, as also in the machinery for forming and finishing the same.

1746. G. Mabie. Improved machinery for mowing and reaping. Partly a communication.

1749. J. Derbyshire. Improvements in cocks, taps, and valves.

1774. W. L. Anderson. Improvements in propellers.

1776. J. Denis. Improvements in cutting or perforating steel and other metals. A communication.

1780. J. Dickinson. Improvements in anchors, and in the manufacture of the same.

1783. H. Remington. An improved gas-heating and cooking apparatus.

1797. A. W. Anderson. Improvements in refining sugar.

1800. H. Evette. Improvements in looms for weaving.

1801. J. Denis. An improved gelatinous and economical soap. A communication.

1825. R. Reeves. Improvements in machinery for sowing or depositing seeds and manure.

1835. C. T. Launay and J. Chopin. Improvements in increasing the illuminating power of gas.

1838. A. Wright. Improvements in lighting mines and subterranean places with gas.

2006. B. A. Grautoff and C. H. W. Albrecht. Improvements in the construction of pressure and vacuum gauges. A communication.

2007. T. Watson. An improved beer-engine lever, or lifter and apparatus for fitting the same to counters.

2178. A. L. Newman. Improvements in processes for separating animal from vegetable fibre, and for adapting the products to manufacturing purposes, and in the machinery employed therein.

2346. J. Bunnett. Improvements in the manufacture of metal sash-bars, columns, and mouldings for building and decorative purposes, and for a method of protecting the same or other articles from oxidation.

2376. W. Johnson. Improvements in railway brakes. A communication.

2504. L. A. Mangin. A self-acting door-spring.

2535. R. Hampson. Improvements in lubricating steam engines.

2539. T. C. Salt. A new or improved method of coating with glass or enamelling surfaces of cast iron.

2585. H. Bessemer. Improvements in the manufacture of rails or railway bars and axles.

2589. S. Cotton. An improved mode or method of regulating or governing lift, tilt, or other hammers worked by mechanical power.

2615. J. Webster. A new or improved instrument or apparatus for transmitting hydrostatic and pneumatic pressure, which said instrument or apparatus is applicable to pressure-gauges, safety-valves, thermometer pumps, and other like machines.

2635. J. B. E. V. Alaux. A lubricating composition.

2639. H. Bessemer. Improvements in the manufacture and treatment of iron, and in the manufacture of steel.

2659. W. Lukyn, sen. A buffer-brake for railway carriages or trucks attached to locomotive engines, whether one or more engines, for the conveyance of goods or passengers.

2660. G. I. Bache. Improvements in lamps and apparatus for affording or supplying artificial light.

2664. W. H. Balmain and T. Colby. Improved means of grinding various substances.

2677. S. Newington. Improvements in dibbling-appatatus.

2680. J. Kinniburgh. Improvements in moulding and shaping metals.

2690. J. B. Heu. Improvements in preserving animal and vegetable substances suitable for food. A communication.

2695. C. Binks. Improvements in converting iron into steel, and in giving a coating of steel to iron.

2703. R. Mushet. Improvements in the manufacture of iron.

2711. C. Binks. Improvements in the manufacture of iron and steel.

2723. R. Butterworth. Improvements in the means of securing the ends of rails for railways.

2726. H. Bessemer. Improvements in the manufacture of iron.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

2758. Georges Edouard Gazagnaire.
2762. Louis Cornides.
2771. John Carter Ramsden.
2772. Alexander Macomie.
2778. Auguste Edouard Loradoux Bellford.
2783. Peter Armand Lecomte de Fontainemoreau.
2784. Edward Keating Davis.
2788. John Patterson.
2798. John Henry Johnson.
2804. Alexander Brown.
2810. Samuel C. Lister.
2820. Squier Cheavin.
2851. Joseph Robinson.

LIST OF SEALED PATENTS.

Sealed November 28, 1856.

1283. Frederick Luke Stott, Thomas Belward, and James Findlow.
1299. Gustavus Gidley and William Christopher.
1301. Bennett Johns Heywood.
1305. Victor Jean Baptiste Mauban.
1330. Edward Hatton.
1331. Duncan Morrison.
1333. Duncan Morrison.
1349. James Somerville.
1380. Armand Eugène Preux.
1386. John Henry Johnson.

1438. Charles Clifford.
1489. Charles Durand Gardissal.
1515. John Henry Johnson.
1550. Joseph Henry Van Hengel.
1658. Jean Louis Lucas and Albert de Briges.
1973. James Wadsworth.
2120. William Henry Forster.
2134. John Talbot Pitman.
2161. Alfred Vincent Newton.
2184. Thomas Callender Hinde.
2223. John Morrison.
*2249. Arthur Albright.

Sealed December 2, 1856.

1303. Auguste Cadet.
1314. George Josiah Mackelcan.
1315. Edwin Heywood and Thomas Ogden Dixon.
1334. John Christophers.
1341. Andrew Edmund Brae.
1360. Samuel Dyer.
1377. Carlo Pietroni.
1388. Alfred Vincent Newton.
1425. Henry Holland.
1426. John Sadler, Josiah Green, and Thomas Davis.
1440. Caleb Perry Sharpley.
1475. Isaac Atkin and Marmaduke Miller.
1560. William Hickling Burnett.
1598. Henry Bollmann Condy.
1608. Alfred Vincent Newton.
1680. Charles Barlow.
1837. Thomas Barnabas Daft.
2163. Robert Walker, jun.
2214. John Roberts and James Beech.
2251. John James Russell and Joseph Bennett Howell.
2282. George Tomlinson Bousfield.
2382. Timothy Gilbert.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICE TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

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LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, *in the City of London*.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, *Dublin*; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1740.] SATURDAY, DECEMBER 13, 1856. [PRICE 3D.

Edited by R. A. Brooman, 166, Fleet-street.

JOPLING'S WATER METERS.

Fig. 1.

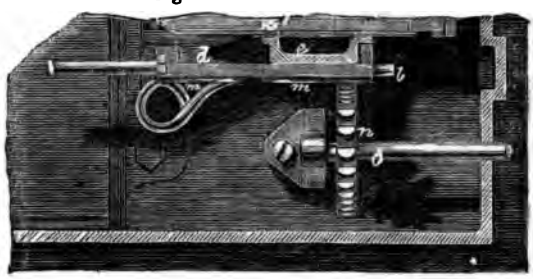


Fig. 4.

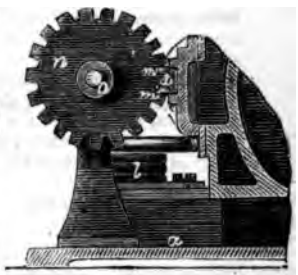
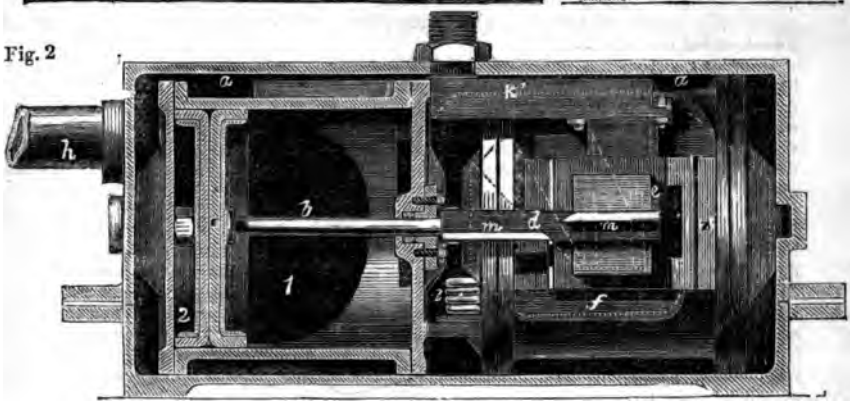


Fig. 2



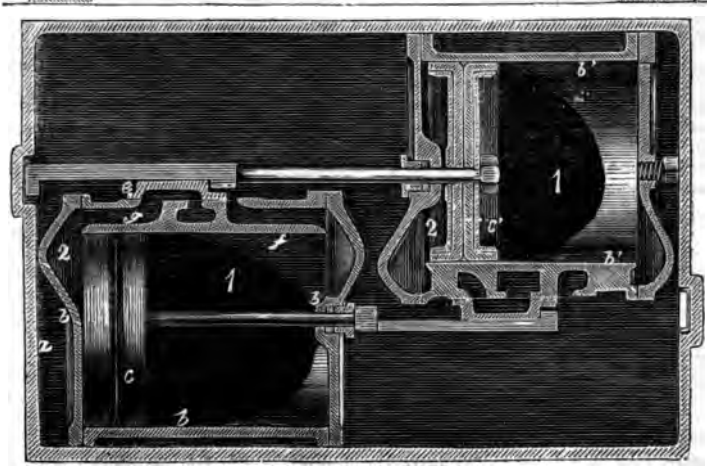


Fig. 3.

JOPLING'S WATER METERS.

A paper on recent improvements in water meters was read Dec. 2, at the Institution of Civil Engineers, by Mr. T. T. Jopling. After alluding to the generic merits and defects of piston and bucket meters,—merits generally appreciated, and defects apparently inseparable from these machines, and as yet only partially removed,—the author proceeded to describe a meter constructed on the piston, or diaphragm principle, which appeared to meet the objections hitherto made to that class of meter. It consists of two measuring cylinders, which are each provided with a working piston, the rods of which severally carry a slide-valve frame. Or, in lieu of the piston, a flexible diaphragm may be used. These cylinders are enclosed in a water-tight case, into which the liquid to be measured first flows before entering the cylinders, and the inventor thus provides for the deposit of stones and other extraneous matters that enter with the liquid instead of allowing them to flow into the measuring cylinders or chambers. These cylinders are so arranged with respect to each other, that the ports of the one (for letting water into the cylinder at opposite sides of the piston alternately) will be covered by a loose slide valve, which is carried by a valve frame attached to and actuated by the piston rod of the other cylinder. The lead-off passages of the two cylinders all connect with a common discharge pipe, and as the apparatus is double-acting, a continuous discharge will take place. The action of the one piston is so dependent on the other, that all tendency to create shocks or produce sudden and unequal pressure will be avoided. On the frame of one of the slide valves the inventor forms teeth for driving a toothed wheel connected with a counting apparatus, and thus obtains an indication of the number of strokes made by the pistons, and consequently of the amount of liquid passed through the meter.

In order that the construction of the improved meters may be clearly understood, we have had the engravings on the preceding page prepared. Fig. 1 is a partial plan view: fig. 2 a sectional elevation; fig. 3 is a sectional plan view, showing the arrangement of the inlet and outlet passages and valves, and fig. 4, is a partial cross section. *a*, *a*, is a cast-iron water-tight case, composed of two parts bolted together, and enclosing two cylinders or measuring chambers, *b'*. In these chambers work pistons, *c*, *c'*, the piston rods of which are arranged parallel to each other, and severally carry at their outer ends a frame, *d*, for supporting and operating the valves, *e*, *e*, which govern the supply and discharge passages *f* and *g* of the cylinders, *b*, *b'*. The valve of the cylinder, *b*, it will be seen, will be operated by the reciprocating motion of the piston rod of the cylinder, *b'*, and the valve of the cylinder, *b'*, by the piston rod of the cylinder, *b*. *h* is the pipe for admitting water to the case, *a*: and *i* is a pipe connected to the cylinders *b* and *b'*, by their respective pipes, *k*, and *k'*, and intended to discharge the water from the meter as it is measured. When the valves are in the position shown in the engraving, the filling of the space 1 of the cylinder, *b*, will have been just completed, and in that completion the piston will (through its rod and the frame which it carries) have shifted the valve of the cylinder, *b'*, and thereby have cut off the supply of water to the space 1 of that cylinder and brought the other end 2 in communication with the outer case, *a*. The end 2 will therefore now be filling, and when the filling is on the point of completion, the piston, *c'* (by reason of the frame which its rod carries), will cause the valve of the cylinder, *b*, to assume the position indicated by the dotted lines, fig. 3, and thereby cut off the supply from the space 1, and let on the water to the other end 2 of that cylinder. From this explanation it will be understood that the valve of the one cylinder is shifted just previously to the completion of the stroke of the piston of the other cylinder, and by the direct action of that piston communicated through the piston rod and the frame which it carries. Each frame is fitted with turned-up or flanged ends, which act as tappets, and strike respectively the opposite ends of the valve, and cause it to open and cover the passages *f* and *g* alternately. For the purpose of keeping the valves, *e*, close up to their seats, the inventor provides fixed springs, *l*, *l*, which press lightly against the back of the valves. The valve frame of the cylinder, *b'*, is furnished at back with two teeth or chamfered ribs, *m*, *m*, which during the reciprocating motion of the frame alternately take into the teeth of a wheel, *n*, keyed to a shaft, *o*, in connection with any suitable counting apparatus, and thus cause the number of traverses made by the pistons to be marked on the counting apparatus, which number indicates the amount of liquid that has passed through the meter. The passages of the cylinder, *b*, it will be seen, are very similar in their arrangement to those for admitting steam to a steam engine cylinder, but those of the cylinder, *b'*, are arranged so as to cross each other. Their course may be best traced in fig. 2, where the port, shown open, is that for admitting water to the end of the cylinder marked 2 (fig. 3), and the closed port is that for admitting water to the space marked 1 (fig. 3), of the cylinder, *b'*. The working of this meter, it will be understood, *must be* smooth or without jerk, as the pistons may be said to float in a body of water, the

pressure being equal or nearly equal on both sides of the pistons; the pressure of the water being sustained by the outer case, the internal parts of the meter may be made comparatively light, and there will be little liability of leakage. When diaphragms are applied in place of pistons, they are constructed in any well-known and approved manner, and connected at their centre to the reciprocating rods which carry the valve frames.

The merits of the improved meters were admitted by the engineers of the Sunderland Water-works, where the meters had been compared with meters by other manufacturers, and exhibited identical results.

HEARDER'S INDUCTION COIL.

We are enabled this week to lay before our readers some further particulars respecting Mr. Hearder's improvements in the Induction Coil, together with some of the circumstances which led to them, and we have the more pleasure in doing this, as we gather from some remarks in a recent paper published by Mr. Hearder, that he refrained from giving early publicity to his improvements in consequence of having confided the particulars to a friend who was about to publish a work on Electricity, which, however, has not yet appeared. We rather doubt the correct policy of this course, as it might have subjected him to the chance of being anticipated by others, who, hearing of his success in some casual notices of his labours, which appeared in the early part of this year, might have had their attention drawn to the subject; and we are not quite sure that this may not still be the case.

Mr. Hearder stated, in a paper which was read by him, to the Members of the Plymouth Institution and Devon and Cornwall Natural History Society, in March of the present year, that his attention was first drawn to the subject, by hearing of some remarkable experiments made by Professor Grove, with a new kind of Induction Coil, manufactured by M. Ruhmkorff, of Paris. Having, however, learned, on inquiry, that the precise arrangement of the machine was, from the mode of its construction, enveloped in secresy, he proceeded at once to act upon his own experience, and constructed an apparatus with all its elements, distinct from each other, so as to be able to examine the function of each individual part and ascertain the effect of modifications of any of its parts. About the middle of last year he had so far satisfied himself on the best mode of procedure, as to have arranged the different elements in such a relation to each other as to develop an extraordinary amount of statical tension in the induced current, and he proceeded at once to experiment with this arrangement. Many of his scientific friends were cognizant of his labours and watched them with interest. Although Mr. Hearder had thus completed his machine in the latter part of last year, he had not proceeded far enough with his investigations to be able to bring them before the public until March of the present year; but, nevertheless, he has the merit not only of being the first to construct a successful statical Induction Coil of this kind in England, but of having in his first attempt far surpassed the most powerful productions of the French manufacturer.

There are some peculiarities in the construction of Mr. Hearder's instrument which are worthy of particular notice, because they appear to us not only to be important advantages over M. Ruhmkorff's arrangement, but serve to indicate the correctness of the principles by which Mr. Hearder has been guided. In M. Ruhmkorff's apparatus, one part is, at it were, built upon another, and every part so thoroughly imbedded in melted shell-lac, that it would be an exceedingly difficult matter to unwind his coils to repair accidents, or to examine any alteration which may have taken place in its internal conditions. Since the power to be developed by these machines must greatly depend upon the perfect character of the system of insulation, and since there is a possibility of straining this point so far as to occasionally break down insulation even of a very perfect kind, Mr. Hearder has so contrived his apparatus as to be able to take any portion of it asunder, and thereby repair any accident that might occur from misuse or otherwise.

The first machine constructed by him consisted of a wooden bobbin lined with gutta percha, about six inches long in the clear of the ends, and having a hollow centre large enough to receive a primary coil with its included iron core. Upon this bobbin about a mile and three-quarters, subsequently reduced to a mile and a half, of secondary coil were wound, consisting of fine copper wire well covered with silk, and carefully varnished with shell-lac, which was allowed to dry previously to laying on. The layers were separated from each other by thin gutta percha or oiled silk. The interruptor was a very stiff spring, vibrating against a contact screw, and actuated by the end of the iron core, on the same principle as the spring of the medical coil machines. The condenser is in the base of the instrument, the coil is also furnished

with a commutator for changing the direction of the current. This little apparatus, the bobbin of which is about half the length of that of M. Ruhmkorff, and the secondary wire about one-third in quantity, gave static sparks more than an inch in length in free air, and communicated such a charge to Leyden jars as to enable Mr. Hearder to make the discoveries detailed by him in a recent paper in the *Philosophical Magazine*. Since the construction of this first machine, Mr. Hearder has made a second of extraordinary power. The bobbin is 12 inches in length, and the secondary wire rather less than three miles, but, with these exceptions, the other arrangements of the apparatus are the same as in the smaller one. The length of statical spark developed by this machine, with twelve cells of a nitric acid battery, the platina plates of which are 2 ins. by 4 ins., is nearly 3 ins. in free air, and it readily produces a spark of more than 12 ins. in length through the flame of burning alcohol. With it, some new phenomena have been developed, and others which have hitherto been deemed peculiar to the Induction Coil, have been found to be peculiar only to its mode of construction and comparatively feeble energy; for instance, with Ruhmkorff's machine, the terminal only, which proceeds from the outer end of the coil, gives static sparks to an uninsulated neutral conductor, whilst that proceeding from the inner end, gives no sparks and may be handled with impunity. When the current passes between the ends of fine platina wires, the negative electrode only is heated, whereas in Mr. Hearder's machine, both the inner and outer terminals give strong static sparks which are insupportably painful, and at certain distances both positive and negative terminals are not only heated but melted. Such effects as these, obtained with a single machine, have never before been heard of; but in a recent paper in *Les Comptes Rendus*, M. Foucault states that he has succeeded in obtaining a spark of nearly 3 ins. in length, by the combined effect of four of M. Ruhmkorff's machines, but that, in order to work them in series, it was necessary to have them peculiarly constructed, as the secondary coil was not otherwise sufficiently insulated. Now when it is considered that the united length of wire in these machines was probably not less than twenty miles, and when we find that Mr. Hearder has produced an equal effect with a single machine, containing less than three miles, there can be very little doubt that his instrument is based upon much sounder principles, and the *success* already attained warrants us in *believing* that much more will be speedily *accomplished*.

NEW PATENTS OF MR. BESSEMER.

Mr. Bessemer has just filed the specifications of patents for two new inventions, the nature of which will be understood from the following extracts. The first is for "Improvements in shaping, pressing, and rolling malleable iron and steel," and is thus described by Mr. Bessemer:

"When ingots or masses of malleable iron and steel are formed by forming or running the metal in a fluid state into moulds, it is generally found that the ingots, or masses so produced are more or less spongy or cellular, and that owing to this circumstance and to their crystalline condition, such cast ingots or masses are apt to be crushed or broken when put between rollers of the kind now ordinarily used for rolling malleable iron I have also found that the ordinary rolling mill does not afford the desired facility for rolling with heavy masses of metal, such as may be produced by casting.

"The object, therefore, of my present invention, is to lessen or remove these disadvantages of the ordinary rolling mill, by the use of the apparatus which I will now proceed to describe,—and which consists of a pair of stout frames or standards of cast iron, farther strengthened by rods or bars of malleable iron, and which are secured to a massive bed plate mounted on masonry. Between these standards I place two segments of a cylinder or roll of very large diameter. The curved surfaces of such segments are placed next to each other, and each one is capable of motion on an axis working in suitable bearings formed in the standards before mentioned. The curved portion of the segments are formed by preference of chilled iron or steel, and the other part of cast iron, and one or both sides of them should be provided with segmental spur gearing so arranged as to insure a corresponding motion of each segment, one or both of which is to be attached to a connecting rod or rods; the opposite ends of these rods are also to be connected to a crank, the constant rotation of which will produce a reciprocating motion of the segments. The crank shaft should have on it a heavy fly wheel to regulate the motion, and it may also serve as the crank shaft to any convenient form of steam engine; or the crank shaft of the segment mill may be actuated by any suitable gearing driven by steam or water power. The faces of the segments are to have grooves formed therein similar to the grooves formed on the rolls at present in use for rolling bar iron, so that the ingot of cellular metal will thus be supported laterally during the pressing operation, and will be prevented from being crushed or broken to pieces

and will be so acted upon on every side as to weld or close up any cavities that may have existed therein, and thus render the ingot solid, and capable of bearing the action of the ordinary rolling mill.

"It will be understood that if the segments employed are parts of circles of from 10 feet to 20 feet in diameter, that they will press on a much greater length (at one time) of the ingot than would be the case if ordinary rollers, of about 18 inches in diameter were used; and also that there will be much less tendency to separate the ingot into pieces when pressed between such comparatively flat surfaces as are presented by the large segments before described. The reciprocating motion communicated by the crank to the segments will cause them to act on the ingots, both in passing in between them, and on its coming back to its original position, so that no time will be lost in the process, and the labour of returning the mass of metal by hand, as practised in ordinary rolling mills, will be avoided.

"In order to bring the curved faces of the segments nearer to each other, as the compressing and elongating operation proceeds, I use a hydraulic press-cylinder, having a short ram acting on the brasses in which one of the segments rest. A force-pump, actuated by any convenient moving part of the machine, will inject a regulated quantity of water into this cylinder at each motion of the segments, and will thus bring them nearer together; or any convenient arrangement of screws or eccentrics may be used in lieu thereof, if desired.

"At both sides of the apparatus I fit up several light guide rollers, for the purpose of receiving the mass of metal, and allowing the workmen to move or turn it over as required. The ingot or mass of metal may thus be pressed and shaped into the form desired; or it may be finished by rolling in a suitable rolling mill, until it is reduced to the desired form and dimensions."

The second patent for "Improvements in the manufacture of iron and steel," is thus described by Mr. Bessemer. "In carrying into practical operation the manufacture of malleable iron and steel, by forcing atmospheric air or steam into and among the particles of fluid crude iron, for which patents have already been granted to me, I have discovered that certain modifications of and additions to the apparatus and processes therein described, may be advantageously used, and the adaptation of which improvements to the manufacture of iron and steel, forms the subject of my present invention.

"In the first place, I construct a cylindrical iron vessel, one end of which is closed and rests on a brick foundation; the interior of the cylinder I line with segmental fire bricks, which, for some distance from the bottom, rise up as a vertical wall, and then close over so as to leave only a small aperture of about one-twelfth or one-sixteenth of the area of the lower part of the vessel, thus giving to the interior somewhat the form of a pottery kiln about the throat of the chamber.

"I make a second chamber, of any convenient form. I, however, prefer it to be cylindrical, with a dome shaped crown; this upper chamber must also be provided with one or more outlets, and also with a feeding door and a damper plate to close up the outlets to the extent desired. Around the lower part of the vessel I insert several tuyere pipes, formed of fire clay, black lead, sand stone, or other refractory substance. These pipes extend through the lining of the chamber, and are held in place with a packing of loam or sand, rammed in around them, the outer ends of the pipes being connected in any convenient way to the blast or steam pipes, by means of which air or steam is conveyed into the chamber for the purpose of rendering the crude iron malleable."

THE BESSEMER PROCESS.

In the hope of contributing to the settlement of a question which has already too long disturbed the public mind, we have imposed upon ourselves a task which we think should have been spared us, and present to our readers such an analysis of Mr. Bessemer's iron as we have been daily hoping to see published by that gentleman himself. The specimen we have experimented upon possesses those physical properties which, from repeated descriptions, the public are sufficiently familiar with. The iron consists of an agglutinated mass of large brilliant crystalline grains, possessed of a very imperfect malleability, flattening, under the blow of a hammer, but almost invariably cracking at the edges. It is wholly destitute of a fibrous structure, and only after having been repeatedly heated and drawn out in a smith's forge exhibits the properties of an inferior wrought iron. On analysis it was found to have the following composition:

Iron	98·9
Phosphorus	1·08
Sulphur	0·16
Carbon	0·05
Silicon	trace
	100·19

This composition is so accordant with the physical properties of the iron that, the the composition being given the chymist

would have had no difficulty in predicating its more marked characteristics. Its crystalline structure and fusibility are very satisfactorily accounted for. In order more exactly to illustrate the nature of the change effected by Mr. Bessemer's treatment, we append an analysis of refined iron produced at a large establishment in the neighbourhood of Birmingham. We are indebted to the courtesy of Dr. Percy for this analysis. It was made in his laboratory by one of his assistants, Mr. Dick: the iron was obtained only a few months ago, and may be regarded as representing the average composition of refined iron as made at the present moment in this neighbourhood:

Iron	95·14
Carbon (combined)	3·07
Phosphorus	0·734
Silicon	0·63
Sulphur	0·157
Manganese	trace
Residue, insoluble in hydrochloric acid	0·53
	100·261

The residue, insoluble in hydrochloric acid, yielded—

Silica	0·3
Alumina, with a little proxide of iron	0·14
	0·44

In contrasting the change effected by Mr. Bessemer's treatment with that of the refinery, the following particulars force themselves strongly upon our notice. Mr. Bessemer's method removes most effectually the carbon and the silicon, while in the refinery these are but little diminished. The carbon is eliminated with a perfection which we should scarcely have thought possible, but we are without information as to the sacrifice at which this has been effected; the amount of iron oxidized by the vivid combustion which Mr. Bessemer induces we are unable to ascertain. The point which most prominently strikes the chymist in Mr. Bessemer's iron is the large amount of phosphorus which it contains—an amount utterly fatal, we fear, to the value of Mr. Bessemer's method. His treatment, we suspect, does not sensibly diminish the amount of this element; but this, too, is a point on which we must be dependent on Mr. Bessemer. We have had no opportunity of examining the slag produced in the treatment, but we learn from an eminent chymical authority that at least one sample of it contains no sensible amount of phosphoric acid. We have previously explained that it is by the puddling process that the phosphorus and sulphur are mainly removed, the chymical examination of the tap-cinder of the puddling furnace disclosing an abundance of phosphoric acid. As yet, so far as we can learn, Mr. Bessemer has done nothing towards the removal of this pernicious element phosphorus, and in this important respect his process must be regarded as a failure. From the number of patents Mr. Bessemer has commenced (one so late as the 18th ult.) he appears virtually to confess the transition state of his improvements.

In taking leave of this subject, we think we may safely predicate that the iron manufacture will remain unaffected in any essential respect by anything which Mr. Bessemer has done.—*Birmingham Journal.*

NORMAND'S MARINE BOILERS.

Mr. Charles B. Normand, of Havre, France, ship-builder, has introduced the following improvements in the construction of marine boilers, the object being to make them more compact than heretofore when required to carry a high pressure of steam. In the case of small war steamers, where it is required to set the engines as low as possible, to be out of reach of shot, instead of setting the cylindrical tubular portion of the boiler in the rear of the fire-box, he places it at the side, and causes the flame to pass to the tubes through a transverse fire-box. This arrangement reduces marine high-pressure boilers to about one-half the ordinary length, and dispenses with the space required at the back for cleaning the tubes. When more height is to be disposed of, he places the cylindrical part of the boiler immediately over the furnace. He also proposes an arrangement of marine boiler intended to supply surcharged or super-heated steam. The hot gases, after having travelled through the ordinary horizontal tubes, pass to a chimney through a number of vertical tubes, the lower ends of which are inserted in a horizontal plate riveted at right angles to the ordinary tube plate. To maintain a rapid motion of the steam round these heating tubes a screen-plate is provided, which separates them from the rest of the steam chest. The steam collected at top by a pipe is admitted at one end of the rectangular space, and flows transversely to the other, where the steam pipe is affixed, after having gone across the whole range of heating tubes. He also proposes an arrangement for effecting the transmission to the feed-water of marine boilers using the salt water of a great part of the heat contained in the "blow-off." The "blow-off" and feed water are brought respectively into separate intermediate vessels, which are kept in communication at their upper parts by a

pipe. The temperature of these vessels stands between that of the boiler and that of the hot well, but nearer to the latter in proportion to the excess in the volume of feed-water to that of the "blow-off." The steam generated by the reduced pressure of the "blow-off" passes to the feed-water, and, raising its temperature, is thus brought back to the boiler. A supplementary feed-pump is placed between the heating vessel and the boiler, and as in most cases the presure in the heating vessels will be below that of the atmosphere, the "blow-off" will have to be drawn by a pump. In vessels making long voyages it is often necessary to put down the fires in one of the boilers to clean the tubes. During this operation the steam supply is not only lessened by the withdrawal of one of the boilers, but the draught of those under fire is much impaired by the rush of cold air ascending through the smoke-box doors of the detached boiler. To prevent this evil, Mr. Normand proposes to fit inside the smoke-box dampers moving on horizontal hinges, which may shut off all communication with the chimney while the tubes are cleaned. If partitions are provided in the fire-box to separate the flame and gases of each furnace, corresponding vertical plates may be set in the smoke-box; and thus some furnaces in one boiler may be kept steaming while the tubes over those adjoining are being cleaned.

INDIA-RUBBER STOPS FOR DOORS, &c.

Mr. Greenwood, of Arthur-street West, London Bridge, is manufacturing a very useful description of India-rubber stops for excluding draughts and dust from doors, windows, &c. He fits in a groove, at a proper angle at the edge of the stop, a slip of India-rubber which forms an elastic spring, and which, when the door or window is closed, makes a tight joint, and excludes air, dust, and sound. These spring stops are made in various neat and ornamental forms, and may be used in the best apartments. They are also very useful for the doors of glazed and other cases which require to be kept air-tight.

A simple form of right-hand stop is shown in fig. 1, in which the crossed portion represents the stop and the dark line the India-rubber.

Fig. 1.

It is shown as applied to an opening door in fig. 2.

Fig. 2.

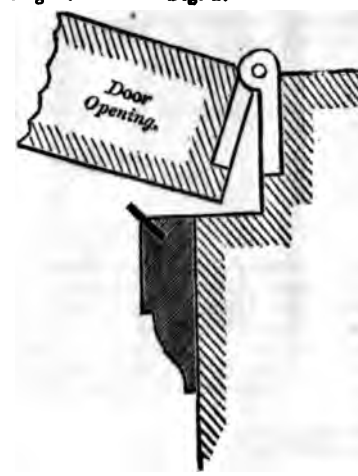


Fig. 3 is a self-acting slide (upon the same principle) for the bottoms of doors, showing the side next the door.

Fig. 3.

A is a piece of oak about 2 inches wide, and ¼ of an inch thick, rabated at the bottom edge with a rod of wood, B, to fit, and working with two brass plates, C, at a proper angle, and regulated by a spring, D. The rod, B, being a little longer, when the door closes, is forced forward, and, with the strip of India-rubber, E, closes tight upon the floor or step. The part A is fixed with screws to the bottom of the door. The rod B must be *even with* the end, and pressed tight on the floor, with the door shut. When the door is open, the spring draws up the rod and India-rubber, and when the door closes, the rod is forced down again, and the India-rubber fills up the uneven parts in the floor or step. F, is a section of end of slide.

The slides must be cut the exact length between the India-rubber after the stop is fixed, and the brass small plate fixed at the bottom of the stop for the end of the rod to work against.

BULMER AND SHARP'S IMPROVED BRICK AND TILE MACHINERY.

MESSRS. BULMER AND SHARP, of Middlesborough, York, have patented an improvement in the machinery used in the manufacture of bricks, tiles, &c., which consists in the employment of a revolving arm or arms, of any suitable shape, working in a chamber beneath or connected with a pug mill, for the purpose of pressing the clay (or other plastic material) from such chamber after its passage from the pug-mill, and in the introduction of a series of pins or guide-rods, attached to a bar or bars within the moulds, to steady the clay in its passage, either directly from a pug mill through the moulds, or from a chamber beneath or connected with a pug mill. Their invention further consists in facilitating the exit of the clay by the introduction of steam into, or among, or in contact with the material at or near its exit from the moulds.

Fig. 1 of the annexed engravings is a section of a pug mill in its improved form; fig. 2, a plan, through the line, *a*, *b*, showing also the rollers for conveying the bricks from the moulds. A, A, is the frame, bolted or otherwise fixed to the base, B; C is the top or headstock, secured to the frame, A, A, by screws and nuts, *e*, *e*. In a bearing about the centre of this headstock, C, the vertical shaft, D, works. This shaft, D, passes through a hole in the floor, A', stepped at bottom in the socket, *f*, on the base, B, and is caused to revolve by means of the bevil wheel and pinion, E and F, the wheel, E, being fixed to the upright shaft, D, of the pug mill, and the pinion, F, keyed or otherwise fixed on the shaft, G', which receives motion from a steam engine or any other prime mover. To the shaft, D, are fixed arms, G, G, for working or pugging the clay prior to its being forced into the moulds by the arm or propeller, H, working in the chamber, H'. *g*, *g*, are a series of guide-rods, for the purpose of steadying the clay in its passage to the moulds; I, I, pipes for admitting steam into and among the clay prior to its exit from the dies or moulds; *h*, *h*, are rollers for conveying the bricks, tiles, &c., to the cutting apparatus (not shown in the engravings); K is a hopper for receiving the clay to be operated upon.

Fig. 1.

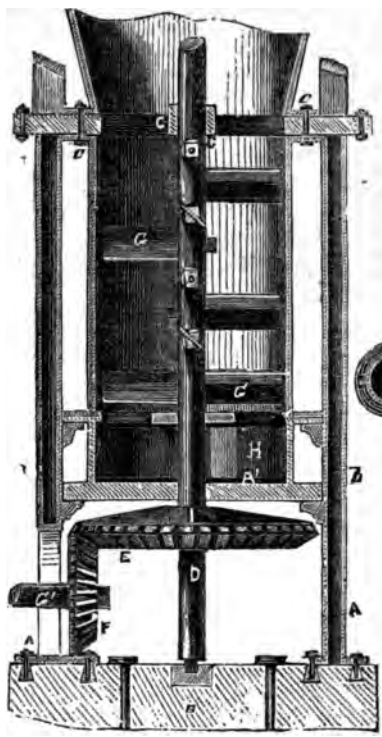
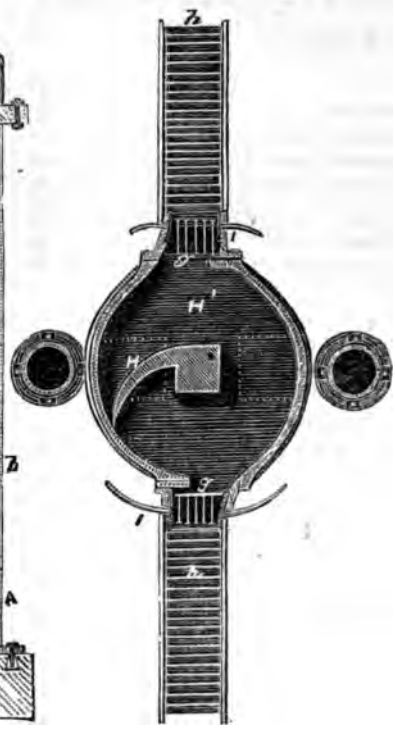


Fig. 2.



THE LONDON MECHANICS' INSTITUTION.

THE appeal made on behalf of this institution in our last number has been responded to in an unexpected manner, by the remittance of subscriptions for its benefit to our office. As the only especial connection that exists between ourselves and the Institution is purely historical, we had no intention, at the time of writing our appeal, of identifying ourselves with the movement now in progress in its favour; but as our readers have themselves chosen to make us the channel of their liberality, we cannot do other than assent to their wishes in the matter. We desire it to be understood, therefore, that we shall be glad to receive, until the end of the year, any subscriptions which may be contributed through us to the relief of the existing difficulties of the Parent Mechanics' Institution. We are anxious, however, it should be distinctly known that, in making this announcement we are merely yielding to the expressed wishes of our readers. We are careful upon this point, because, however warm may be the interest we feel in the Institution in question, we should never have *originated* a money subscription on its behalf. At the same time we shall be highly gratified at being made the medium of bountiful spontaneous aid.

We would intimate also that much general good might be done if subscribers to the Institution fund would send with their remittances such suggestions as may occur to them for the improvement of the many Mechanics' Institutions throughout the country which are less flourishing than could be desired. If this is done, we will do our best to afford their suggestions publicity, and if possible to give them ultimately some useful practical form. The course we have here indicated was suggested by a private letter which accompanied a cheque for £5—the first subscription which came to hand—and which contained a practical hint or two of which we shall not lose sight.

THE MANUFACTURE OF SMALL SHOT.

HITHERTO the making of small shot *from molten metal has ordinarily* been performed by hand, in the following manner: At the top of a suitably high shot tower is placed a perforated dish or colander, on the upper side of which is spread a coating of scum or oxide of lead; the workman then removes a quantity of molten metal from the melting pot in a ladle, and pours the metal very gently into the perforated vessel. The metal thus poured in, a small quantity at a time sweats gradually through the skin or sheet of scum, and thus the particles become separated, and each drop falls from the top of the tower into a pool or vessel containing water. During their descent the drops of metal should become perfectly spherical; in practice, however, a considerable proportion of the whole of the drops or shots so made are found to be imperfect and unsaleable, requiring to be remelted, after having had the expense of manufacture and sorting expended upon them.

In order to remedy this defect and to make shot more rapidly than heretofore, a new process has recently been patented by Messrs. Charritie and Smith, of London, by which process the manufacture is rendered independent of the skill of the workmen employed. Instead of the perforated vessel and the coating skin or scum, as above described, the following mechanical arrangement of apparatus has been substituted. A plate of metal, of suitable thickness, is drilled with a number of holes in parallel rows, and these holes may be countersunk or made conical. This plate should be correctly faced on its under side, and may have fillets or strips of metal fixed on each side by means of screws. To these fillets or side strips another plate is screwed or attached, forming the bottom plate, and this plate has a series of holes or of parallel slots or openings corresponding with the rows of perforations or drilled holes in the upper plate. These two plates, when adjusted, have a parallel space between their faces into which another or third plate fits accurately, and is made to slide backward and forward. This third plate is of a thickness, and has holes drilled in it of a size suitable to the size of the shots required to be made; and these holes are drilled so as accurately to correspond with the holes in the upper plate, so that at one part of its travel the two sets of holes in it and in the upper plate, with the countersunk holes, precisely coincide. The slots or openings in the lower plate are not immediately below or opposite to the holes in the upper plate, but are about two diameters in advance of them, and they are thus fixed together and mounted on a suitable frame.

The middle or sliding plate, which may be of sheet steel, has at each end an attachment to a crank, spanner, or lever, by which it is moved backward and forward,

and is stretched and held firmly like a saw in a sawing frame. Several of these sliding plates may be connected together and worked from one or more shafts, with suitable cranks or eccentrics to give the precise amount of motion or travel necessary for the purpose. Thus several sets of apparatus for making the same size, or various sizes of shots, may be fixed on suitable framings over the same pit, or within the shot tower, and they may be connected or geared together and worked by one man or by any other power, the action being as follows:—The molten metal is allowed to flow into the upper plate, around which there is a rim, ledge, or hopper, and the middle or sliding plate is caused to move, so that its holes coincide with the holes in the upper plate when they become filled with molten metal; the plate is then rapidly moved forward or backward until its rows of holes coincide with the rows of holes or the slots or openings in the lower plate, and the contents of the whole of the holes in the sliding plate fall through such slots or openings whilst in a molten state, being thus perfectly gauged as to the quantity in each of the holes, and therefore ensuring that each shot shall be precisely of the required size. Thus, each time the holes in the upper and middle plate coincide, a quantity of shots, corresponding with the number of holes in the upper plate, can be produced with accuracy.

DE LA RUE'S ENVELOPE PATENT.

VICE-CHANCELLOR'S COURT, DEC. 2.

(Before Vice-Chancellor Sir W. P. Wood.)

DE LA RUE *v.* DICKINSON.

THIS was a motion for an injunction to restrain an infringement of the patent enjoyed by the plaintiffs for folding and cementing the flaps of envelopes in a peculiar manner. The plaintiffs, who were wholesale stationers, had taken out patents in 1845 and 1849 for certain improvements which they had invented in the manufacture of envelopes, the improvement in the second of these patents being the employment of certain machinery for the application of gum or cement to the flaps of envelopes in the manner of surface printing. The apparatus was exhibited at the Great Exhibition of 1851, in Hyde Park, and attracted considerable attention. The defendants were manufacturing stationers at King's Langley, in the county of Herts, their London establishment being in the Old Bailey. The plaintiffs alleged in their bill that the defendants had for some time past manufactured envelopes by machinery similar to or with only colourable deviations from that which formed the subject of the plaintiffs' patent inventions. A correspondence had been carried on between the parties by their solicitors upon the subject, with a view to legal proceedings, the correspondence having commenced as early as 1850, but it was not until May last, according to the allegations in the bill, that the plaintiffs were able to inspect the machinery used by the defendants. A report had been made to the plaintiffs by the persons employed by them to inspect the defendants' machinery, stating in effect that such machinery was made or arranged according to the machinery forming the subject of the plaintiffs' patent, or only differing therefrom colourably; while the defendants, on the other hand, alleged that the machines used by them for manufacturing envelopes were constructed according to a patent granted in 1849 to one Amédée François Rémond. The plaintiffs had filed their bill to restrain the defendants from using for folding envelopes any machines similar to that produced for inspection at their factory in May last, and generally from infringing the patent of the plaintiffs, and they now moved for an injunction.

Mr. Rolt and Mr. Fooks (with whom was Mr. Lush, of the common law bar) appeared in support of the motion; Mr. Cairns, Mr. Webster (of the common law bar), and Mr. R. Hawkins were for the defendants, but were not called upon.

The Vice-Chancellor said that after the delay shown by the plaintiffs he could not grant them an injunction. In 1850 they had reason to believe that Rémond's machine had been introduced and was being used by the defendants, and in October of that year they had traced the machine into their possession, though perhaps they were not then in a position to prove its use. The defendants had six months later admitted the manufacture of envelopes by such a machine, and the only question was, in truth, whether the plaintiffs might not then, or at all events after 1852, when the new practice was introduced, have placed themselves in a position to obtain an inspection. It seemed almost a matter of course that there must have been a power of obtaining inspection during all this time. The plaintiffs, however, had been contented to lie by between five and six years, allowing the manufacture of envelopes to go on all this time, without making any application for the only thing necessary—an inspection—either at law or equity. This species of laches was always discouraged, and he could do no more now than direct the motion to stand over, with liberty for the plaintiffs to bring an action at law for the infringement, the defendants admitting the use of the same machine as had been inspected.

HILLS' GAS PATENT.

COURT OF EXCHEQUER, DEC. 2.

(*Sittings at Nisi Prius, before the* CHIEF BARON *and a Special Jury at Westminster.*)

HILLS V. THE LONDON GAS COMPANY.

Mr. Knowles, Mr. Grove, and Mr. Hindmarch, were counsel for the plaintiff; Sir Frederic Thesiger, Mr. Hill and Mr. Webster appeared for the defendants.

This was an action for the infringement of a patent for "a new mode of making gas and for obtaining substances applicable to the purifying of gas." The defendants rested their case on the ordinary pleas, denying the novelty of the patent, its utility, and the infringement.

Mr. Hills, who carries on chemical works at Deptford, applied himself to the subject of gas making and purifying in 1849, and, after many experiments, succeeded so far as to induce him to take out a patent in November for making gas from peat and other substances, and for discovering new substances for its purification. In due course a specification was enrolled, from which it appeared that he proposed to substitute hydrated oxide of iron, mixed with sawdust, for lime, as a purifier, while he pointed out that this substance, when saturated, was capable of being renovated by exposure to the air, by which means all the sulphur was eliminated from the iron, so that the whole process was both effective and economical. This new process found great favour with the gas companies, and many used it, paying the plaintiff a royalty; but the defendants having claimed to use it without any recognition of the plaintiff's rights, this action was brought, but not until the plaintiff had disclaimed a great part of his patent, confining his title and specification to a new mode of manufacturing gas, and the renovation of the substances as above-mentioned.

On the part of the defendants it was contended that the patent of the plaintiff was based upon and identical with that of Mr. Croll, which had been taken out in 1840; that the use of hydrated oxide of iron was public before 1850, the date of the plaintiff's patent; and the discovery of the revivifying effect of the atmospheric air on the "used up" hydrated oxide of iron was attributable not to the plaintiff but to the observation of a gentleman named Evans, who being engaged in experiments with hydrated oxide of iron had casually noticed the change of colour produced on a mass of that substance, which had been thrown aside as too greatly charged with sulphur to be further used. This change of colour proved on examination that the air had expelled the sulphur and renovated the purifying powers of the substance—a fact which was *disclosed to the plaintiff* himself and to the Chartered Gas Company by Mr. Evans before the plaintiff had enrolled his specification. On these grounds the plaintiff's title to the claim of an inventor and protection of the law was disputed. In the course of the trial the chief chemical talent of the day, beginning with Professors Taylor and Brand, was examined on one side or the other.

At the conclusion of the evidence given on behalf of the defendants,

The CHIEF BARON stated that, in his opinion, the plaintiff had failed to support his patent, and after a lengthened discussion it was arranged that the plaintiff should be non-suited, with a reservation for the consideration of the Court above, and power to either party to tender a bill of exception to its judgment.

The plaintiff was thereupon called and non-suited.

Table of Quarter-Squares of all Integer Numbers, up to 100,000, *by which the Product of Two Factors may be found by the aid of Addition and Subtraction alone.* By SAMUEL LEWIS LAUNDY. A. I. A. London: C. and E. Layton, Fleet-street. 1856.

EVERY person who has the smallest knowledge of Algebra knows that

$$a\,b = \frac{(a+b)^2}{4} - \frac{(a-b)^2}{4};$$

in other words, that the product of two numbers may be found by taking a quarter of the square of their difference from a quarter of the square of their sum. From this it is easily seen that by the aid of a table representing the fourths of the squares of all integer numbers up to any given amount, the product of any two such numbers may be readily obtained; because it will only be necessary first to add the given numbers and take from the table the quarter-square of their sum, then to subtract the two numbers and take out the quarter-square of their difference, and then to subtract the latter quarter-square from the former, the difference obtained being the product required. It is just such a table as we have mentioned that Mr. Laundy here publishes, carrying the numbers, of which the quarter-squares are given up to 100,000.

It will be apparent to persons accustomed to arithmetical computation that such a table possesses, in some cases, greater advantages than tables of logarithms, because only two references to the table of quarter-squares are required in each multiplication, while with logarithms three are necessary, and one of them in a reverse one, so to speak, occasioning a

greater exercise for the mind than is necessary where all the references are of an identical character. And beside this, in using the table of quarter-squares, there are no characteristics or indices, and no distinctions of positive or negative to trouble one's-self with. These are very important considerations for persons who have to spend much time in multiplying numbers. We quite agree with Mr. Laundy, who says in his preface, "To the banker in computing interest on accounts current, &c.; to the architect and civil engineer in estimating superficial and cubical quantities; to surveyors in the admeasurement of land; to the merchant and tradesman in carrying out quantities and prices in invoices; to the astronomer in his scientific researches; and to the actuary in his investigations, the table will be alike available as a means of abridging the labour incident to their calculations, or of checking computations made by the ordinary process."

We cannot, of course, say much respecting the accuracy with which the table is printed, but we are able to say that the author thoroughly understands how to compute it in the best manner possible, (as is evident from his prefatory remarks,) and further that the following means adopted by him, were such as to secure great accuracy in the printing of it. Having been entirely calculated in duplicate, the types were set up from one of the workings, and the proofs read against the duplicate. After correction, the several pages were stereotyped, and proofs from the plate again read against the duplicate; defective figures were then marked and corrected; and finally the sheets were printed from the stereotype plates. We may add that we have tested several of the quantities, taken at random, and found them accurate.

Mr. Laundy's is not the first table of quarter-squares that has been published in this country. Professor Leslie, in his "Philosophy of Arithmetic," tabulated them up to 2,000, (taking them, as it appears, from a work of Voisin's), and Galbraith, in his "General Tables," up to 3,149. Mr. Laundy also informs us, that Mr. Peter Gray has in his possession the MS. of a Table of Quarter-Squares, by Major Shortrede, extending to 200,000. These facts, however, do not diminish the utility of Mr. Laundy's work, which is the only comprehensive table of the kind to which the public have access.

VICTORIAN DECIMAL SYSTEM.

THERE yet remains one modification to be considered, and it is one which by many would be preferred to the others. If, instead of taking 4,000 sovereigns, as before proposed, we take the eighth part, or 500, our "ped" will then be half the former length, or only 6½ ins. Our rule then would be two peds long unopened, and four peds when open. The sixteenth of an inch will then be a cardinal measure. The following may be said in favour of this modification. The rod would be 5 ft. 2½ ins. long, a most excellent length for a lath or baton to measure buildings, &c., the rod now used being five feet long. A surface one of these new rods wide, and ten long, would be equal to 271·52 square feet, a very happy approach to the present rod of brickwork, which is 272 square feet. The new mile would be 0·9873 of the old mile. The degree would be 69·967 such new miles, or so near to 70 miles, that if a brass measuring rod were used at the temperature of about 10° Fahr., it would be exactly 70 miles, and the earth's circumference exactly 25,200 miles. The bushel of 10 gallons ($10p^3$) would be 2,444 cubic inches—an excellent bushel. The weights, of course, as before, derived directly from the sovereign. The new rod would easily supersede the fathom in measuring depths, ropes, chains, &c., from being so near it in length, and would be a great boon to builders, as length into breadth would give rods of brickwork, without, as now, dividing by 272. If railroads were compelled to carry passengers at four mils per mile, they would have a shorter mile to carry them.

J. SIMON HOLLAND.

Woolwich.

FLYING BY MAN.

To the Editor of the Mechanics' Magazine.

SIR,—I confess I have little hopes of this desirable object being much forwarded by the correspondence published in your last few numbers. One of your correspondents appears to be a captious, as well as a dubious reader; at page 469, he suggests a form of apparatus by which he expects to obtain certain results; in the following number (p. 518) I admit that with such an apparatus these results would be attainable, but would be attended by other circumstances which would render them useless. A "Dubious Reader," at page 542 is pleased to designate my affirmation as "mere assertion, and not worth a straw," because it is not substantiated by "proof." In stating as the inevitable consequence of natural laws, that the rotation of the vanes would ultimately be communicated to the whole apparatus, I did not think it necessary for *one* (and that a dubious) reader, to go into the A B C of the matter, or to adduce proofs supported with all the logical argument of a mathematical formula, and terminating with the usual Q (uite) E (asily) D (one)! If a "Dubious Reader" saw any good rea-

sons for supposing the effect I prognosticated would not take place, why not submit them to the ordeal of critical examination?

A "Dubious Reader" says, "with regard to the apparatus being at the mercy of the winds, I think at any rate it could be controlled *as well as ordinary balloons are*;* for when a vertical sail is added, the business of steering through the air would become comparatively simple"! Permit me to say, a vertical sail under such circumstances would be a perfectly useless incumbrance; excuse the absence of "proof." If not asking too much, however, I would request a "Dubious Reader" for once to drop that character, and *carefully* read my communications on this subject at page 10 of your 60th, and page 39 of your 26th volume; the contents of which will, I trust, considerably enlighten him on the subject of "sailing and steering through the air in any direction."

Your correspondent, Mr. Carroll, page 542, has, by measuring the wing surface of a chicken, weighing 3 lbs., ascertained that a pair of wings 3 ft. 8 in. superficial, will enable a youth of 112 lbs., "to wing his way through the liquid air." Any *goose* would have told Mr. Carroll that *two* important elements are involved in this question, one of which he has entirely ignored. In order to fly, there must be *motion*, as well as *surface* of resistance. A pair of wings, of the dimensions stated, moving at a given rate, would doubtless produce the desired effect; but if moving with less velocity, a large resisting surface would be required; while, with a more rapid motion, smaller wings would suffice. What is the rate of motion necessary to be given to the wing surface, quoted by Mr. Carroll, and how is that motion to be obtained?

It verily seems that, although the Marquis of Worcester's suggestion has been 200 years before the world, no person has yet appeared with ingenuity sufficient to give a practical answer to this question.

I remain, Sir, yours, &c.,

WM. BADDELEY.

Angell-terrace, Islington, Dec. 9, 1856.

FACTS AND FANCIES.

To the Editor of the Mechanics' Magazine.

SIR,—I am afraid that we, Mr. Pitter and his hopeful disciple, shall make slow progress in the reformation of philosophy. It will take us some time to demolish Sir Isaac Newton, although we are assisted by such great philosophers as Messrs. Symons, Hopkins, and Mushet; yet I am determined to do my part towards the accomplishment of so great a work. My part will be to point out to my master any little microscopical errors that may find their way into our teaching, and also where there may be a chance of our being misunderstood. I regret that my master has been so occupied with his other great scheme, in which I can take no part, that he has taken no notice of my sincere questions; for the little note bearing his signature is evidently a forgery. *He*, to a certainty, would either have attempted to grapple with the objections raised or kept silent. No, no, he would never have written a note confessing his inability in such plain terms; so I yet have hope that those trifling difficulties may be cleared away. All great men meet with difficulties in endeavouring to destroy old errors, or to establish new and important truths. Perhaps some brother disciple of longer standing would be kind enough to lend a hand. With such hope I put the following *sincere* questions. When one thing approaches another, it necessarily moves. Now am I to say that the reason why the iron remains stationary is because it approaches the magnet? *The reason why it does not move is because it does move!*

It requires more force to lift a piece of iron from off a magnet than from off a piece of wood. Am I to say that it is because while I am lifting it from off the magnet it is approaching the magnet? *That while it is moving upwards it is also moving downwards!*

What am I to say if asked "what is the lowest temperature at which you can ignite any gas or mixture of gases that may be set free from a bog or marsh?"

"By what means can they arrive spontaneously at such temperature?"

If I do not get satisfactory answers to these *sincere* questions, I am afraid that Mr. Pitter will have written the following sentence in vain: "If I am reasonable and sound on other topics, why not on this?" And then again what is to become of your humble servant his faithful.

DISCIPLE?

* When, or where, was an ordinary balloon ever controlled?

MODERATOR LAMPS.

To the Editor of the Mechanics' Magazine.

SIR,—We know that every part of the moderator lamp is old, the combination is merely new; and I think, upon consideration, it will be seen that although pronounced a really useful invention, there is more in the oil used than in the machinery for moderating it; for, according to the theory and claims of the instrument, we ought to be enabled to get any degree of light, which certainly is not the case.

Now, can any one inform me why camphine is not used for these lamps? It has

a much greater illuminating power than the rape or colza oil; and although I would not say that the process of elevating the oil to the burner is destitute of some good effect, yet I think that if camphine were used, we should have a light for intensity and brilliancy as yet unequalled.

The difficulty of managing camphine has often presented obstacles to its use; but it will be generally found to arise from not allowing a sufficient quantity of air to ascend to the burner; while as to danger, unless great carelessness is displayed, there is nothing to fear.

Prejudiced as the public always have been to the use of naphtha, and the more so from a late accident from that liquid, I would not say a word to change the popular opinion, as the vapour arising from the volatile substance causes imminent danger, even with the greatest care.

I am, Sir, yours, &c.,

A Dubious Reader.

November 22, 1856.

P.S. I think that the principle employed in the common Argand lamp for raising the oil might be successfully applied to camphine; in fact I consider that if such were done, but for the appearance of lamps where the liquid is caused to flow from a higher level, the moderator lamp would soon cease to be used.

THE EARTH'S ROTUNDITY.

To the Editor of the Mechanics' Magazine.

Sir,—Well acquainted as we all are with the form of the earth, and the numerous proofs that we have testifying to our correctness, it strikes me that one has been omitted, or if not, I have never seen any mention of it.

If the earth were an extended plane, it would then have a centre of gravity somewhere, but bodies situated directly above the centre of gravity would be the only ones which, when let fall, would describe a line forming a right angle with the plane of the earth's surface. All others, according to their distances from this point, would form greater or lesser angles with this plane. Hence the very fact that bodies falling from all parts of the earth's surface, fall at right angles with its plane, proves beyond doubt, its rotundity. Hoping that this may prove worthy of insertion in your useful periodical,

I am, Sir, yours, &c.,

An Observer.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

Fisher, S. *Improvements in the manufacture of anchors, shafting for mill and engine purposes, axles, cranks, and spindles, and in the furnaces or muffles used in the said manufacture.* Dated Apr. 4, 1856. (No. 816.)

The object is the manufacture of the above articles of malleable iron. As Mr. H. Bessemer claims the founding or casting of anchors in malleable iron under a recent patent, the present patentee lays no claim to the manufacture of anchors in malleable iron, except as far as regards improvements in annealing the same. His muffle is thus constructed:—He employs two retorts of fire-brick or fire-clay, the one placed concentrically inside the other immediately above the fire-bars; the outer retort is simply an iron case lined inside with fire-brick, with a dome-shape lid, and a flue at the top having an outlet immediately under the lid communicating with the stack. Into the inner retort is placed the article to be annealed; the whole of the vacuum remaining in this retort is then charged with the same description of iron ore as that which furnished the iron from which the articles have been cast, after which the top of the inner retort is built over in the fire-brick. It is essential that this inner retort should be hermetically sealed, or as nearly so as possible, that no air may be admitted to the casting whilst under process of annealing.

Ramié, C. W. *Improvements in constructing the permanent ways of railways.* Dated Apr. 4, 1856. (No. 818.)

In this invention ordinary double-headed rails are used. On either side of the rails are fixed wings or plates resting on the ground, and fixed either continuously or at intervals. The plates or wings, are rolled in the form of angle iron, so that the edge of a plate or wing will lie close to the web or side of the rail, and admit of bolts being passed through both. The plate comes in contact with the lower head of the rail and rests thereon; it is formed to incline upwards from the lower part of the rail to the outer edge of the plate or wing, in order to facilitate packing. On the undersides of these wings or plates are fixed angle irons; the flanges of these come under the rail, and by being fixed to the wings or plates are capable of being drawn towards them, and to form under supports for the rail, &c.

Bousfield, G. T. *Improvements in moulding planes.* (A communication.) Dated Apr. 4, 1856. (No. 819.)

The face of the improved plane may be separated from the body so that many faces (having different mouldings thereon) may be used in conjunction with one body.

MARTIEN, J. G. *Improvements in the manufacture of iron.* Dated Apr. 4, 1856. (No. 820.)

This invention was described at page 366, of No. 1732.

HOGG, J., and J. NAPIER. *Improvements in stereotyping.* Dated Apr. 5, 1856. (No. 822.)

This invention was described at page 418, of No. 1734.

WEBSTER, J. *A new or improved elastic metallic tube, and the method of manufacturing the same.* Dated Apr. 5, 1856. (No. 825.)

This invention was described and illustrated at page 481, of No. 1737.

BERNARD, J. *Improvements in machinery or apparatus employed for manufacturing or making boots and shoes or other coverings for the feet.* Dated Apr. 5, 1856. (No. 827.)

This invention, which comprises eight heads, cannot be described without illustrations.

STURLEY, H. T. *An improved compound or breakfast mixture.* Dated Apr. 5, 1856. (No. 829.)

This invention consists in compounding into a mixture the following ingredients: namely, malt, rice, and chicory, the malt and chicory each in about equal proportions, and the rice in the proportion of about one-eighth thereof to seven-eighths of the malt and chicory when mixed.

MORTON, A. *Improvements in the manufacture of paints and pigments.* Dated Apr. 5, 1856. (No. 830.)

This invention relates to improvements on a patent dated 13th July, 1853, No. 1667, by which the processes there described are simplified and rendered more efficient, and the colours are rendered faster and more permanent than before.

MADDISON, W. P. *An improved telegraph or apparatus for the transmission of signals.* Dated Apr. 5, 1856. (No. 831.)

This invention consists in transmitting signals by exerting pressure upon atmospheric air in a tube, one end whereof is fitted with a small cylinder, piston, and piston rod, to the top of which a small weight or hammer is affixed, the said cylinder being held in proper position by screwing the same to a piece of wood. There is a bell fixed to the wood immediately over the hammer, which is caused to strike the said bell by compressing the air in the tube, for which purpose the opposite end of the tube is connected to a pair of bellows.

UNDERHAY, F. G. *Improvements in apparatus for drawing off water.* Dated Apr. 5, 1856. (No. 833.)

When constructing sluice works, to facilitate the application and removal of the wearing surfaces, the bushes of gun metal are formed into rings and fixed to ring plates, each of which has a rib formed on the side opposite to that on which the bushing is fixed, the object of which is that a washer of vulcanized India-rubber may be introduced between it and the face in the slide box of the sluice box. The slide is formed with corresponding bushings or flat rings of gun metal, and to fix the face plates with their bushings correctly in the box of the sluice cock, the two face plates with the flexible washers and the slide are introduced into the slide box of the sluice cock, and they are then fixed to prevent the face plates coming towards each other when the slide of the sluice cock is moved out from the face plates. The patentee also describes a method of arranging stand pipes.

CRAIGIE, H. *Improvements in heating apartments where gas and water are used.* Dated Apr. 5, 1856. (No. 834.)

This invention consists of an apparatus for heating water by gas burners. It is constructed of vessels one or more within another, having a water space or spaces between them. The inner vessel forms a chimney surrounded by water; and at the lower part is placed a gas burner so that the air may pass internally as well as externally of each ring of flame employed.

LEIGH, J. *The use or application of a certain substance or substances in the sizing, stiffening, or otherwise preparing cotton, linen, or other yarns and woven fabrics.* Dated Apr. 7, 1856. (No. 838.)

The substance named is silicate of soda or silicate of potash.

MORRIS, E. *Improved machinery for raising and lowering weights.* Dated Apr. 7, 1856. (No. 839.)

This invention cannot be described without illustrations.

NEWTON, W. E. *An improved construction of furnace for the manufacture of glass.* (A communication.) Dated Apr. 7, 1856. (No. 840.)

This invention consists in constructing shelves within the cone of an ordinary glass furnace, for containing the batch of raw material (consisting of soda and lime), in order to heat the same to a high temperature before it is introduced into the crucibles, thereby utilizing the otherwise waste heat which would escape at the top of the cone, preventing the breaking of pots, and reducing the labour and time occupied in charging the pots or crucibles.

GARDISSAL, C. D. *Preparing various resins and combining them with oils and fatty matters for manufacturing candles thereof.* (A communication.) Dated Apr. 7, 1856. (No. 841.)

This invention consists in applying to the manufacture of candles, the vegetable matters myrica, cerifera, and carnoba, combined with other oils and fatty matters, after a previous bleaching, by means of hypochlorites, &c.

MORTON, A. *Improvements in the manufacture of paper-hangings for decorative purposes.* Dated Apr. 7, 1856. (No. 842.)

This invention consists in a number of improved modes of combining and treating the materials employed in paper staining.

TERRY, W. *Improvements in breech-loading fire-arms.* Dated Apr. 7, 1856. (No. 843.)

The patentee describes an arrangement of the parts of a breech-loading fire-arm, the principal object of which appears to be to prevent the accidental discharge of the piece.

FULLER, W. C. *Improvements in constructing and adapting India-rubber as tyres for wheels.* Dated Apr. 7, 1856. (No. 844.)

The patentee makes the India-rubber tyre by combining cloth or canvas (or other fibrous material) and sheet rubber, in alternate layers upon a cylinder or annulus corresponding in diameter to the size of the wheel. The canvas will prevent the India-rubber from unduly stretching, as at present. Also, instead of springing the India-rubber into its place and fastening with pins, he proposes to fix it tightly on to the outer rim or felloe of the wheel.

GAUNTLETT, W. H. *Improvements in thermometric apparatus.* Dated Apr. 7, 1856. (No. 846.)

In this invention two tubes or rods of different metals are combined together at one end, the other ends being connected and communicating with each other in the following manner:—To the free end of one tube or bar is fixed a dial or graduated plate, having thereon an axis, on which is placed a pointing hand and a pinion, worked by a rack. Or, instead of the rack and pinion, some other method of communicating motion, is adopted.

GOLD, S. J. *An improvement in apparatus for warming buildings by steam.* Dated Apr. 8, 1856. (No. 848.)

This invention (which is to be used in connection with apparatus patented by C. F. Stansbury, 13th April, 1855) relates to the regulation of the furnace draught, and to the automatic cooling of the boiler when the entire steam generated is not required. The first function is performed by a flow of water from the boiler into the draught passage, so as to diminish its capacity, or close it entirely as circumstances require, thus constituting the hydraulic seal. This rise of water is caused by the pressure of steam in the boiler. The second is effected by the lifting of a valve above the furnace, by the rise of water above the point where the hydraulic seal is applied, when, after the draught is cut off, there is still an excess of steam above what is required, this lifting being produced by a float which rises as the water from the boiler flows into a chamber provided therefor.

DEVAUX, A. C. L. *Improvements in the construction and the fitting up of granaries.* Dated Apr. 8, 1856. (No. 850.)

This invention relates—1. To a novel granary, the object being to obtain a perfect ventilation of the grain; and, 2. To the use of certain contrivances for facilitating the storing of grain in granaries, and the discharging of the same therefrom. The invention cannot be described without illustrations.

NEWTON, W. E. *Improvements in the process of manufacturing steel, and carbonizing iron, and the ores thereof, in the said manufacture.* (A communication.) Dated Apr. 8, 1856. (No. 851.)

This invention relates—1. To deoxidizing and carbonising iron ores, and producing therefrom either spring steel or cast steel, and it consists in treating the ore in a comminuted state, and mixed with charcoal or other carbonaceous matter, with or without other flux, depending on the nature of the ore, in a close cementing oven, retort, or other close vessel at a high degree of heat, and after it has been deoxidized (if an oxide), or the carbonic acid expelled (if a carbonate), and then carbonized, separating the metallic particles of steel from the remaining impurities; and then, for making spring steel, welding the particles in a re-heating furnace, and rolling or hammering it into bars; and for cast steel, melting the particles of carbonized metal in crucibles, in the usual manner of making cast from blistered steel. 2. To deoxidizing and carbonizing the ores of iron in the manufacture of steel direct from the ore; but this part of the invention is also applicable to the deoxidizing and carbonizing of iron ore for any purpose desired, and also to the carbonizing of iron after it has been reduced from the ores for the conversion thereof into steel. The improvement consists in subjecting the ore or the iron after it has been reduced from the ore, when mixed with carbon, to the action of heat and cyanogen.

CURTIS, W. J. *Improvements in lubricating the axles of locomotive engines, and of carriages on railways.* Dated Apr. 8, 1856. (No. 852.)

These improvements consist in causing the lubricating fluid to be raised from below the axles by centrifugal action, by applying a disc or projection to each of the axles, the periphery of which rotates in a vessel below

the axle, and by centrifugal action constantly raises the lubricating fluid above the axle, and throws or projects it against a suitable surface and receptacle for conducting it down on to the upper surface of the axle.

BROOKE, J. *Improvements in lift pumps.* Dated Apr. 8, 1856. (No. 854.)

In the improved pumps, the bucket is composed of two metal cones, one fitting into the other so as to hold the cup leather between them, there being a central passage through each of the cones, covered by an ordinary valve. The two cones are fixed together by a fork or prongs at the lower end of the pump rod, which pass through the cones, and draw them together by screws and nuts at the lower end of the prongs. The lower part of the pump barrel has an internal shoulder to act as a seat for the lower or sucker valve, the stem of which has three wings. Above the seat the diameter of the pump barrel is enlarged in order to get a free flow of water around the valve, which is provided with a ring of flexible substance, where it rests on the shoulder or seat.

WHITGREAVE, J. R. *Improvements in the arrangement and construction of locomotive engines.* Dated Apr. 9, 1856. (No. 856.)

The patentee places the steam cylinders midway between two pairs of driving wheels and axles, which are so disposed as to bear nearly the whole weight of the engine; a third or fourth pair of wheels is added as leading or travelling wheels to complete the complement of six or eight wheels required for safety. The cylinders are placed horizontally, and fitted with the ordinary valves and valve gearing, worked in the usual way, but having the piston rod carried through the piston and out through stuffing-boxes at both ends of the cylinder; thus the weight of the piston and its rods are carried by the guides, and the friction of the piston upon the under side of the cylinder is prevented. Connecting rods are attached to both ends of the piston rod of one cylinder, the one connecting rod communicating with one of the cranks on the leading driving wheel axle, and the other with one crank of the rear driving wheel axle; both of these cranks are acted on simultaneously by one cylinder and piston, and caused to revolve in the same direction. The opposite cylinder is similarly fitted and furnished. The connecting rods of the one cylinder communicate with cranks on the leading and rear driving axles, which cranks are placed at right angles to the other cranks on their respective shafts. Another improvement refers to the method of connecting the tender, and consists in forming the end of the tender convex, and presenting the section of a cylinder or circle with a vertical axis. The end of the engine is concave to suit the curved end of the tender. The engine and tender are connected by a draw bar suitably attached to the engine, and jointed at the point or centre from which the curve of the junction is struck, from which joint to the rear draw hook the draw bar is continued, and slides in suitable bearings. The tender is held close up to the engine while running.

CHRIMES, R. *Improvements in buffer and other springs for railway and other carriages.* Dated Apr. 9, 1856. (No. 858.)

This invention consists in placing two or more helical springs concentrically in a spring box in which works the inner head of the buffer rod or ram.

ARMOUR, J. *Improvements in bleaching textile fabrics and materials.* Dated Apr. 9, 1856. (No. 859.)

This invention relates to the use of the following chemical ingredients in bleaching textile materials (especially "sewed goods" or embroidered muslins), viz., oil of turpentine, coal or mineral naphtha, rosin, oil, benzone, benzele or benzole, sulphide of carbon, and chloroform.

MORRELL, G. F. *Improvements in the manufacture of railway chairs.* Dated Apr. 9, 1856. (No. 860.)

This invention consists in cutting sheet-iron into suitable shapes, and in bending up the sides to form the jaws of the chairs.

LAXTON, H. *An improved mode of adjusting circular saws.* (A communication.) Dated Apr. 10, 1856. (No. 861.)

This invention was described and illustrated at page 27 of No. 1718.

MAKIN, T. W., and J. BARNSLEY. *Improvements in machinery or apparatus for embossing moiré antique water on all kinds of woven fabrics.* Dated Apr. 11, 1856. (No 867.)

This invention relates to an improved mode of giving a watery or wave-like appearance to woven fabrics, a style known as moiré antique. The patentees use rollers with the desired design projecting on the surface. They place one of the rollers in any convenient machine, so that it will revolve in bearings and in contact with another roller of a plain surface, and cause the material to pass through or between the rollers as they revolve.

BURNSIDE, J. *Improvements in apparatus for propelling and steering ships and boats.* Dated Apr. 11, 1856. (No. 869.)

This invention consists in steering and propelling vessels by means of one or more frames or slide-rods, fitted with floats or paddles on one or both sides, and connected at each end to a crank or cranks, or wheels

or eccentrics worked by a steam engine, and caused to rotate so as to enable the frame or side-rods with its floats to enter and leave the water, and thereby produce the steering or propelling action required. The double cranks are carried or supported on outriggers from the sides of the ship.

FONTAINEMOREAU, P. A. L. DE. *An improved apparatus for measuring the speed of currents of air and water.* (A communication.) Dated Apr. 11, 1856. (No. 870.)

This invention relates to improved apparatus, 1. For estimating in a constant manner the speed or steerage way of ships or vessels; also for ventilating the holds of the same; 2. For measuring the velocity of currents of air and water, and consequently, the quantities of liquids run off, either freely, as in a river, or confined in pipes. It consists in certain improvements which render practicable the applications of the principle of contraction, as in the double cone tube. The invention cannot be described in detail without engravings.

JACKSON, G. *A new or improved steam boiler, to be heated by the waste heat of puddling or mill furnaces.* Dated Apr. 11, 1856. (No. 871.)

This invention consists of a steam boiler of a cylindrical or nearly cylindrical figure, set vertically, and having a central chimney, into which the products of combustion, &c., are delivered by horizontal flues, after they have circulated about the vertical sides of the boiler, the chimney being isolated from the upper part of the boiler by an annular air space surrounding the chimney to a depth below the water line of the boiler.

DAVIS, R. *Improvements in the construction of tobacco-pipe stems.* Dated Apr. 11, 1856. (No. 872.)

This invention relates to stems of the meerschaum and other similar pipes, and consists in so constructing and fitting a lining tube of clay (or other material) that it can be readily replaced by another, and that it will, at the same time, be pressed close up towards one end, whereby any passage of the smoke on the outside of the lining tube will be prevented.

MASH, J. *Improvements in the fusible plugs and furnaces of steam boilers.* Dated Apr. 12, 1856. (No. 874.)

This invention was described and illustrated at page 485 of No. 1737.

NEWALL, R. S. *Improvements in telegraphic insulators.* Dated Apr. 12, 1856. (No. 876.)

The patentee makes the insulator of two or more parts, so that the part which holds the wire may be easily removed from the bell, or other support, which is fixed to the post. And he forms the part which holds the wire with a screw, so that by means of a nut he can firmly fix the wire, after it has been properly strained, at each post or point of support. If a wire should break, the ends would fall between two posts, while the other part of the line would remain suspended and tight.

PEDROS, F. N. Y. *A new motive power.* Dated Apr. 12, 1856. (No. 878.)

This invention consists of a combination of wheels, shafts, &c., to be driven by horse-power.

LINDSAY, R. B. *An improvement in removing the scale or deposit from tubular flues of steam boilers.* Dated Apr. 12, 1856. (No 879.)

This invention consists in applying to this purpose highly heated air or steam, which is caused to enter and fill the boiler, and in some cases the tubular flues, by which means the scale or deposit will be caused to crack and shell off.

HEYWOOD, E. *Improvements in fixing apparatus for generating steam, whereby smoke will be prevented or consumed, and fuel economized.* Dated Apr. 14, 1856. (No. 880.)

This invention relates to a mode of fixing vessels or boilers used for generating steam, or for boiling water or other liquid, where two or more fires or furnaces are used, and consists of arranging the furnaces so that as each fire is being supplied with fresh fuel, the smoke is caused to pass down through its own fire to the ash pit, and through tubes, openings, or apertures to the adjoining ash pit, and up through the adjoining fire.

ROBERTSON, P. *Improvements in power-loom weaving.* Dated Apr. 14, 1856. (No. 882.)

This invention consists in an arrangement of mechanism or apparatus connected with the power-loom, by which the shedding motion is stopped, and the shuttle allowed to traverse through the same opening of the warp two or more times, so as to produce cords or tapes alternately, according to pattern, with the usual fabric of the cloth, whether plain or twilled.

SYMONDS, J., and T. M. FELL. *Certain improvements in the reduction of gold, silver, and other ores.* Dated Apr. 14, 1856. (No. 883.)

In levigating hard silicious minerals, previously prepared for reduction, the patentees propose a new arrangement of stamping apparatus, the bed plate being placed at an angle suitable for the delivery of the material after pounding. Stamps of the usual or required weight are placed vertically on this inclined plane, and, by means of ordinary mechanism for raising weights, are allowed to rise and fall, pounding or levigating the material. In fine grinding, when

reducing with water, the apparatus is supplied with sieves through which the material is passed. Ores or minerals, after being reduced to the required fineness, may be submitted to the process of amalgamation herein given, or, when in a mechanical combination, requiring the direct application of heat, to a wind furnace by the combined action of a concentrated blast of atmospheric air, hot or cold, and steam, with a necessary quantity of free carbon, in the form of soot or other cheap carbonaceous material, introduced into the molten ore in a finely divided or pulverised state, thereby better supporting combustion and effecting a saving in the present use of coke, wood, coal, &c. The patentees prefer amalgamating direct, and for this purpose the dry material, or the tailings of the crushing machines, is introduced into a circular cask or cylinder, having projections and partitions for the purpose of triturating the mass with quantities of water, which is thus brought into a fit state to be acted upon by mercury, through which it is passed by mechanical pressure. The obtained amalgam is afterwards heated for the metals, and sublimed by retorting.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

GLASSFORD, J. H. *Improvements in the production or preparation of printing surfaces.* Dated Apr. 3, 1856. (No. 810.)

This inventor first prepares the surface (stone or metal) when the design is intaglio or relievo, by applying thereto a metallic conducting coating, and then places the stone or metal in an electro-deposition trough to be electrotyped. The metallic coating thus formed, when removed from the surface, will have an intaglio or relievo design, as the case may be, which may be used for printing from.

FERNIE, J. *Improvements in hoists by combining steam and a hydraulic column.* Dated Apr. 3, 1856. (No. 812.)

This invention consists of mechanism for hoisting a loaded platform from a lower to a higher level. At one end of a fixed cylinder a pipe is connected, the other end of such pipe being connected to the lower end of a water cylinder of small section, but of greater length than the steam cylinder. In this second cylinder a cup piston works, and on the upper end of the piston rod the platform is fixed. Steam is admitted into the steam cylinder, and drives the piston towards the other end, which causes the water to be forced through the pipe, and to act in the cup piston in the water cylinder, and thus raise the platform.

CHAPPUIS, P. E. *Improvements in looking-glasses to render them double reflective.* Dated Apr. 4, 1856. (No. 813.)

This invention consists of a jointed arm, to one end of which is fitted an upright rod carrying a looking glass, the other end terminating in a clip by which the apparatus may be secured to the back of a chair, the top of a dressing table, or other article of furniture. The object is that a person may observe the back part of the head by looking at the reflection of the moveable glass in a dressing glass.

GARDISSAL, C. D. *The treatment or preparation of fabrics or textile materials to be dyed or printed.* (A communication.) Dated Apr. 4, 1856. (No. 815.)

This new process depends on the principle that textile materials acquire a great affinity for colours, after they have been exposed to the action of nitric acid, or rather to that of a mixture of nitric and sulphuric acid. The textile materials are prepared by a short contact in the cold shade with the acids.

ROBERTS, J. *Improvements in the manufacture of ornamental tiles.* Dated Apr. 4, 1856. (No. 817.)

For producing the ornamental surfaces, the inventor has two plans; the first is this:—Having fixed on a pattern, he takes prepared clay of the colours required, and presses it in a vertical direction by a powerful screw, through dies; when he has obtained as many as are required to form the pattern, he places them all vertically together in a strong frame, and again puts them under pressure so as to bring the several parts fairly together and unite their edges. He then cuts horizontally a slice of the thickness required. For some purposes he strengthens the tiles so produced by affixing cement to the back of the tile. For particular purposes he inserts a piece of iron, with a hole in it, to receive a screw for fixing the tile.

JONES, J. *Improvements in railway chairs, and in the method of securing the rails to the same.* Dated Apr. 5, 1856. (No. 821.)

This invention was described and illustrated at page 86, of No. 1720.

BLAKE, O. *Improvements in the manufacture of glass.* Dated Apr. 5, 1856. (No. 823.)

The inventor proposes to cast the contents of a pot of metal at intervals, but direct from the pot; thus, after casting one sheet of glass, he quickly removes it from the casting table while in its soft state into an annealing kiln, casting other sheets and removing them in like manner until the contents of the pot are exhausted.

KISCH, B. *An apparatus for containing an arrangement of cards or papers for selection.* (A communication.) Dated Apr. 5, 1856. (No. 824.)

This invention consists in so arranging cards or papers, that upon the front or outer one being removed, the next one may be brought forward, until, in like manner, the whole have been withdrawn. To effect this the inventor causes a receptacle to be constructed, and divided into rectangular compartments, each being provided with a yielding back, actuated by a spring movement.

WHITEHEAD, T. R. *Improvements in garments or apparatus to be used for sustaining the human body in water, or for acquiring the art of swimming.* Dated Apr. 5, 1856. (No. 826.)

This invention consists in a substance buoyant in water, or a bag or vessel inflated with air, to be secured to the abdominal region of the human body.

MARTIN, E. *An improved leg-guard.* Dated Apr. 5, 1856. (No. 828.)

This invention consists in making leg-guards (used in cricket) of open cross-bar work or net-work, formed of pads and guards.

MOORE, W. H. *An improvement in the manufacture of candles.* Dated Apr. 5, 1856. (No. 832.)

This invention consists in forming the candle-moulds with grooves on the interior near the outer ends, and in making candles with ribs or projections at their lower ends, the object being to make the candles fit candlesticks the sockets of which are larger than they.

BETTELEY, J. *Improvements in the manufacture of iron for knees for ships or other purposes.* Dated Apr. 5, 1856. (No. 835.)

This invention consists in making double tapered bars of iron by means of rollers having the forms of the double tapered bar cut thereon. The inventor passes iron between the widest part of the rollers, causing them to revolve one and a half or more times, producing thereby a succession of inclined planes in one bar, which, being cut through at the thinnest part, forms double-tapered shapes of iron from which knees can be made.

GEDGE, J. *Improvements in tiles for buildings.* (A communication.) Dated Apr. 7, 1856. (No. 836.)

The inventor proposes to make tiles with projections or receptacles on or in each, so that when put together they shall form an area of any dimension.

SMITH, J., and J. LUNTLEY. *Treating the sunflower plant to render its fibres applicable to the manufacture of textile fabrics, paper, yarn, cordage, &c.* Dated Apr. 7, 1856. (No. 837.)

This invention consists in dissolving the gummy or resinous matter which binds or holds together the filaments of which the sunflower plant is composed.

ADAMS, J. *Improvements in knitting-machinery.* Dated Apr. 7, 1856. (No. 845.)

In this invention the bent part or beard of each of the needles is itself bent into a hook. The thread-carrier lays its thread on to the skins of the needles after the work has been brought forward and is on the beards of the needles; the newly-laid thread will, therefore, be behind the work, &c.

GRAVES, J., and W. F. HENSON. *Improvements in lubricating carriage and other axles.* Dated Apr. 7, 1856. (No. 847.)

The inventors form on or affix to the journals of the axles one or more rings, or annular ribs, which, dipping in the oil or grease in the bottom of the grease-box, raise a sufficient quantity while rotating to lubricate the journals.

BOWSER, J. C. *Improvements in glove fastenings.* Dated Apr. 8, 1856. (No. 849.)

This invention consists in securing a piece of elastic webbing or cord to one side of the opening at the wrist, to which webbing is appended a small tassel with a hard substance adapted to hold in a socket-piece affixed to the other part of the glove, similar to the fastener used in securing an umbrella when collapsed.

RANSOME, J. A., and G. A. BIDDELL. *Improvements in the manufacture of railway bars and flanch-bearers of railway crossings.* Dated Apr. 8, 1856. (No. 853.)

In place of simply casting railway bars and flanch-bearers of uniform hardness, as heretofore, the casting is so conducted that the surfaces on which the wheels are to run are to be cast harder than the other parts, either by chill casting the wearing surfaces, or else by using different qualities of cast-iron, and running the harder quality into the moulds to come to the wearing surfaces of the bars, and the softer to form the other parts.

GEDGE, J. *Improvements in the treatment or preparation of leather, and in the manufacture of articles composed thereof.* (A communication.) Dated Apr. 9, 1856. (No. 855.)

The inventor proposes, by means of a preparation of quick lime and albumen, to purify and render pliable old leather of any description.

LAXTON, H. *A new and improved apparatus for increasing the buoyancy of ships and other vessels.* (A communication.) Dated Apr. 9, 1856. (No. 857.)

This invention consists of a series of floats of a spheroidal form attached to the side of a vessel by means of chains or ropes made to pass through hollow metal tubes, having slits continued their whole length. These tubes are fixed or built into the sides or ends of the vessel. Windlasses, &c., are used for drawing the chains back,

ward and forward, so as to cause the floats to be placed at such part of the vessel as may be required, in order to raise it either for repairs, or for floating it in shallow water.

NEWTON, A. V. *Improvements in the means of attaching together or securing sheets and pieces of paper, or manuscript documents.* (A communication.) Dated Apr. 10, 1856. (No. 863.)

In this invention, the sheets of paper are punched with holes or notches to receive a band, strap, or cord in various ways. The invention also relates to the use of studs for temporarily attaching several sheets of punched paper together, the space between the stud heads not occupied by the paper being filled by the insertion of a washer of India rubber.

HALL, W. *A method of stopping or retarding the way of ships and vessels, in order to prevent collisions and otherwise.* Dated Apr. 10, 1856. (No. 864.)

This invention consists in employing pieces of timber or other material which are held up out of the water under ordinary circumstances between projecting beams, and which, on being lowered, as for instance, to avoid a collision, present resisting surfaces, and retard the way of the vessel.

HOMFRAY, G. *An improvement in furnaces.* Dated Apr. 10, 1856. (No. 865.)

This invention consists in the interposition of a lining of fire-brick, or other bad conductor of heat, between the fire and the boiler.

HENDERSON, H. *Improvements in water-closets.* Dated Apr. 11, 1856. (No. 866.)

This invention relates to that portion of water-closets which affects the supply of the cleansing water delivered to the basin after the water-closet has been used, and consists of a simple species of "cataract" valve, or valvular apparatus of slow adjustable action, capable of being set to any desired rate of cut off.

PERPIGNA, A. *Improvements in the manufacture of coke.* (A communication.) Dated Apr. 11, 1856. (No. 873.)

The object of this invention is to produce coke possessing hardness and compactness. Coals of different kinds are combined in varying proportions and carbonized together, in place of employing bituminous coal alone.

SCHULTZ, L. *Improvements in obtaining photographic pictures upon paper, glass, metal, plates, and other fibrous substances.* Dated Apr. 12, 1856. (No. 875.)

This invention consists in preparing substances to be used for obtaining photographic pictures upon, by coating them over with a suitable varnish perfectly of a dark colour, so as to give them a smooth surface, and at the same time to prevent them from being injuriously acted upon when immersed in the liquids for subsequent preparation.

FLINT, W. B. *Certain improvements in fasteners for shutters, windows, doors, and such like purposes, and which said fastening is also applicable to the coupling of railway carriages and trucks, and other useful purposes.* Dated Apr. 12, 1856. (No. 877.)

This invention consists—1. In forming the shutter lift or rest for the bar in such a way that it is not possible for the bar to be pulled either up or down on the one shutter without affecting the whole. 2. In forming the pin (that usually passes through the end of the shutter bar and sash frames to be secured on the inside by a cotter) in such a way that it has only to be pushed in, when it will be held on the inside by a spring catch.

PROVISIONAL PROTECTIONS.

Dated September 13, 1856.

2142. Edward Green, of Wakefield, York, engineer. Improvements in scrapers employed to cleanse boiler tubes and flues for economising fuel.

Dated October 25, 1856.

2512. Heinrich Hochstaetter, of Darmstadt. Improvements in obtaining instantaneous light.

Dated November 7, 1856.

2624. Amos Holt and Jabez Bentley, of East Ardsley, near Wakefield, York. Improvements in machinery for weaving stuff and other goods.

Dated November 14, 1856.

2681. Honourable William Erskine Cochrane, of Osnaburgh-terrace, Regent's-park. Improvements in the permanent way of railways.

Dated November 19, 1856.

2727. William Brindley, of Moorgate-street, paper-manufacturer. Improvements in the treatment and application of papier-maché for covering floors, roofs, and other like useful purposes.

2729. Henry John Distin, of Cranbourn-street, Leicester-square, musical-instrument manufacturer. Improvements in cornets and other wind musical instruments. A communication.

2730. William SmithChurchill, of Staly-bridge, Chester, cotton-spinner, and James Bradshaw, of the same place, manager. Improvements in machinery or apparatus for drying yarns or fabrics, applicable to machines for sizing or dressing yarns or threads to prepare them to be woven.

2731. John Jones, of Middlesborough, York, engineer, and Edward Jones, of Liverpool, engineer. Improvements in the manufacture or production and treatment of metal castings.

2732. John Lord, of Rochdale, flannel-manufacturer. An improved admixture or compound to be employed as a substitute for oil in the treatment of animal wool preparatory to carding.

2733. James, Earl of Caithness, of Barrogill Castle, Caithness, N. B. Improvements in driving-belts, straps, or bands for machinery, and in the application and use thereof.

2734. William Edward Newton, of Chancery-lane, civil engineer. An improvement in centrifugal pumps. A communication.

2736. George Watson, of Manchester, and Cornelius Satterthwaite, of Preston. Improvements in the manufacture of fire-lighters.

2738. Alfred Watson and Alfred Hamlyn Williams, of Cornhill, dressing-case manufacturers. An improved cap or top for scent-bottles.

2739 Samuel Fox, of Deepcar, Sheffield. Improvements in machinery for drawing wire and tubes.

2740. Louis Adolphe de Milly, of Paris, manufacturer. Improvements in the manufacture of fatty acids.

2741. Samuel Fox, of Deepcar, Sheffield. Improvements in heating steel wire and tubes, also ribs and stretchers of umbrellas and parasols for hardening, and in apparatus for straightening wire and tubes.

Dated November 20, 1856.

2742. Edwin Salt, of Bolton-le-Moors, Lancaster, engineer. An improved paper-cutting machine.

2743. James Montgomery Gilbert, of Manchester, engraver. Improvements in certain machines for etching or engraving.

2745. Peter Armand Lecomte de Fontainemoreau, of Rue de l'Echequier, Paris. Improved apparatus for preparing carbonic acid gas, and impregnating liquids therewith. A communication.

2746. Charles François Jules Fonrobert, of Berlin. Improvements in the manufacture of boots and shoes. Partly a communication.

2747. Charles François Jules Fonrobert, of Berlin. Improvements in the manufacture of insulated wires for electric telegraphs. Partly a communication.

2748. Thomas Francis Joyce, of Birmingham, manufacturer. Improvements in joining, supporting, and strengthening the rails of railways.

2749. William Morgan, of Gloucester-terrace, Hyde-park. An improvement in heating parts of cylinders and other hollow bodies of iron to a welding heat.

2750. Robert Brock Benson, of New York, U.S. master mariner. Improvements in reefing sails.

2752. Richard Eaton, of Sussex-terrace, New-road, Battersea, Surrey, engineer. Improvements in apparatus for buffing on railways, and for other purposes.

Dated November 21, 1856.

2753. Louis Dartois, of Rue de l'Echiquier, Paris. An improved machine for the cleansing of textile and fibrous substances.

2755. John Norman, of Liverpool, Lancaster, merchant. Improvements in propelling navigable vessels.

2757. John William Clare, of White-street, Surrey. Improvements in preventing, removing, consuming, and condensing smoke and noxious vapours, and in apparatus for those purposes.

2759. Frédéric Ludewig, of Paris, chemist. An improved leaven.

2761. William Edward Newton, of Chancery-lane, civil engineer. Improvements in machinery for spinning or twisting fibrous substances. A communication.

2763. Joseph Barrans, of New-cross, Surrey. Improvements in apparatus for applying oil or lubricating fluid to the axles of railway carriages and locomotive engines.

2765. Richard Archibald Brooman, of 166, Fleet-street, London, patent-agent. A method of and preparation for rendering textile and other like fabrics sanitary and disinfecting agents. A communication from J. Ledoyen and J. Beaulavon.

2767. Thomas Roberts and John Dale, both of Manchester, manufacturing chemists, and John Daniell Pritchard, of Warrington, chemist. Improvements in obtaining and purifying oxalate of soda, which improvements are also applicable to the manufacture of oxalic acid.

Dated November 22, 1856.

2769. William Thomas Henley, of St. John's-street-road, Clerkenwell, telegraph engineer. Improvements in electric telegraphs, and apparatus connected therewith.

2771. Alexander Robert Terry, of Great George-street, Westminster, civil engineer. Improvements in sawing, splitting, cutting, and binding kindling wood.

2773. Edward Tucker, of Belfast, starch-manufacturer. Improvements in preparing and drying glue and gelatinous matter.

2775. Richard Archibald Brooman, of 166, Fleet-street, London, patent-agent. Improvements in the manufacture of artificial wines, or beverages to be substituted for wines, and in apparatus for aiding fermentation. A communication.

2777. William Edward Laycock, of Sheffield, manufacturer. Improvements in looms for weaving.

Dated November 24, 1856.

2781. George Salt, of Saltaire, York, manufacturer. Improvements in weaving carpets and other piled fabrics.

2783. James Kennedy Martin, of Dundee, N.B., shipbuilder. Improvements in hoisting or purchase-apparatus for ships and vessels.

2785. Charles John Lewsey, of Albion-terrace, Commercial-road East, engineer. Improvements in sugar-cane mills.

2787. Henry Brickley, of Stratton, Gloucester, miller. Improvements in mills for grinding.

2789. John Orr, of Glasgow, weaving foreman. Improvements in the manufacture of pile fabrics.

Dated November 25, 1856.

2793. Henry Bougleux, of Leghorn. Improvements in the construction of steam boilers.

2795. John Palmer, of Stockton-on-Tees, Durham, agricultural-implement dealer and manufacturer. Improved means for separating different kinds or qualities of seed or grain from each other.

2797. John Marshall, jun., of Selby, York, oil-refiner. An improvement in the purifying of oils and fatty matters.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," December 9th, 1856.)

1754. J. Ashman. Improvements in the manufacture of artificial limbs.

1778. C. Hodges. Improvements in apparatus for unwinding silk, thread, or yarn from the hank. A communication.

1787. E. Eaborn and M. Robinson. Certain improvements in machinery to be used for confectionary purposes.

1790. P. J. Livsey. Improvements in arrangements and mechanism for rotating and retaining the rollers of window-blinds.

1791. W. Griffin and E. Duley. Improvements in studs and buttons for fastening articles of dress.

1798. F. Caron. Improvements in fastening the handles of door-locks and door finger-plates.

1799. R. W. Sievier. Improvements in preserving wood from decay, and also from destruction by insects.

1804. J. Hopwood. Improvements in machinery for measuring and folding fabrics.

1805. G. Holcroft and P. Johnson. Improve-

ments in the manufacture of cement, and in the application of a known material to cementing purposes.

1806. J. J. Kerr. Improvements in the manufacture of cartridges for fire-arms.

1813. P. M. J. Chamblant. Improvements in the manufacture of glass.

1816. T. Routledge. Improvements in the manufacture of half stuff and paper.

1822. J. Avery. Improvements in bonnets and other coverings for the head. A communication.

1823. E. P. Chevalier. Improvements in the manufacture of cigars.

1824. R. A. Tilghman. Improvements in hydro-extractors or centrifugal machines.

1834. N. Cadiat. The application of centrifugal force for purifying liquids.

1853. G. H. Palmer. Improvements in furnaces for generating heat.

1878. J. Darlington. Improvements in superheating steam. A communication.

1900. A. Priest and W. Woolnough. Improvements in horse-hoes.

1908. H. C. Hurry. Improvements in railway crossings.

1930. P. P. Hoffmann. An improved compound to be used for waterproofing fabrics, paper, leather, or other materials.

1944. J. H. Johnson. Improvements in roller fulling-mills. A communication.

1967. J. H. Johnson. Improvements in stocking-looms. A communication.

2016. J. Blake and F. Maxwell. Improvements in the manufacture of soap. A communication.

2101. R. A. Brooman. An improvement in and apparatus for sprinkling substances in a state of powder. A communication.

2142. E. Green. Improvements in scrapers employed to cleanse boiler-tubes and flues for economising fuel.

2151. J. Buchanan. Improvements in propelling vessels.

2206. J. Underwood and F. V. Burt. The manufacture of copying inks for printing.

2345. W. Wilkinson. Improvements in ornamenting glass, and in the preparation of the materials employed therein.

2439. F. A. Magnay and R. R. Whitehead. Improvements in damping paper for printing.

2501. R. Struthers. Improvements in machinery or apparatus for transmitting motive power.

2505. S. Baxter. Improvements in chain wheels, or barrels and stoppers to be used for raising and lowering weights by means of chains.

2512. H. Hochstaetter. Improvements in obtaining instantaneous light.

2655. H. Baines. Improved machinery or apparatus to be applied to hoisting and other lifting machines.

2658. J. Paterson. Improvements in apparatus for churning, which apparatus is also applicable to the washing of roots and other substances.

2671. W. Green, jun., and T. Storey. Improvements in machinery or apparatus for washing or cleaning coal.

2691. J. Sutherland. An improved railway-break.

2700. N. P. J. Leseure. An improved embroidering machine.

2702. D. J. Hoare. Improvements in the manufacture of iron.

2722. F. A. Magnay. Improvements in damping paper for printing.

2733. James, Earl of Caithness. Improvements in driving belts, straps, or bands for machinery, and in the application and use thereof.

2748. T. F. Joyce. Improvements in joining, supporting, and strengthening the rails of railways.

2749. W. Morgan. An improvement in heating parts of cylinders and other hollow bodies of iron to a welding heat.

2759. F. Ludewig. An improved leaven.

2773. E. Tucker. Improvements in preparing and drying glue and gelatinous matter.

2781. G. Salt. Improvements in weaving carpets and other piled fabrics.

2783. J. K. Martin. Improvements in hoisting or purchase-apparatus for ships and vessels.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

2812. Jonathan Saunders.
2823. Matthew Andrew Muir.
2834. William Edward Gaine.
2837. Julian Bernard.
2839. Alfred Vincent Newton.
2846. William Thomas Henley.
2860. Arthur James.
2865. Richard Eccles, John Mason, and Leonard Kaberry.
2872. John Bourne.
2891. William Frederick Plummer.
2906. Samuel Messenger.
2951. Auguste Alfred Loradoux Bellford.
2964. Archibald Thomson.

LIST OF SEALED PATENTS.

Sealed December 5, 1856.

1359. William Denny Ruck and Victor Touche.
1365. Robert Ferrier.
1366. James Holdin.
1367. James Holdin.
1389. Richard Archibald Brooman.
1407. Hypolitte Mège.
1411. Peter Armand Lecomte de Fontainemoreau.
1464. Charles Minne and Amand Colson.
1466 Jean Charles Lefevre Lacroix.
1477. Edwin Hardon and Joseph Henry.
1487. Jules Etienne Lafond.
1505. David Macdonald.
1609. Alfred Vincent Newton.
1701. James Lawrence Crockett.
1705. James Lawrence Crockett.
1792. Robert Thatcher.
1793. John Knowles and William Buxton.
1913. William Tranter.
1923. Thomas Scott.
2229. Richard Husband.
2235. James Cottrill.
2281. Henry Jenkins.
2378. Frederick Albert Gatty.

Sealed December 9, 1856.

1369. John Ellis.
1370. Benjamin Smith and William Kalthoff.
1378. Perceval Moses Parsons.
1384. William Henry Westwood, Thomas Wright, and Edward Wright.

1399. William Massey.
1495. Robert Wilson Chandler and Thomas Oliver.
1513. Andrew Shanks.
1604. Frederick William Hoffman.
1606. Julien François Belleville.
1712. Richard Archibald Brooman.
1765. George Spence.
1831. Thomas Green.
1861. Alexandre Théodore Nicolas Goll.
2030. Alfred Vincent Newton.
2115. Stephen White.
2265. David Law and John Inglis.
2298. Alfred Vincent Newton.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICE TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

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LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1741.] SATURDAY, DECEMBER 20, 1856. [PRICE

Edited by R. A. Brooman, 166, Fleet-street.

SAVAGE'S MACHINE FOR DRILLING AND ROLLING LAD.

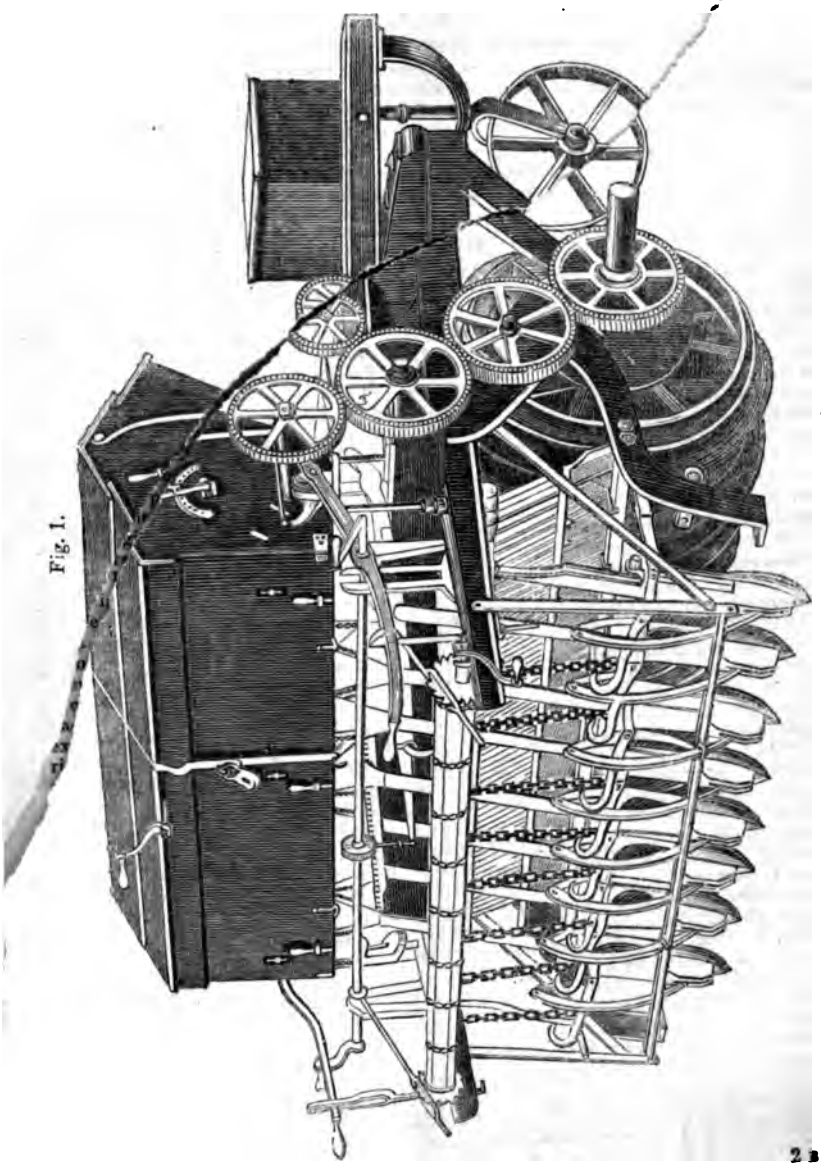


Fig. 1.

SAVAGE'S MACHINE FOR DRILLING AND ROLLING LAND.

Mr. W. P. Savage, farmer, of Roxham, Norfolk, has patented a machine for drilling and rolling land, in which he has adapted to an axle, shaft, or axis a series of discs or wheels, wedge-shaped at their circumference or outer edge, and combined these with revolving coulters, a seed box, and other apparatus. A back view of the machine is shown at fig. 1 of the accompanying engravings. When this machine is moved from place to place, and not in use for rolling or drilling, it has adapted to it travelling wheels and shafts (not shown in the engravings), which can he added or removed by bringing the rolling surfaces to bear on the ground or any inclined surface, or placing the travelling wheels on lower ground than that on which the rolling surfaces rest. The travelling wheels and shafts being removed, the tractive power is applied by whipple-trees attached to the front of the machine. The seed box has an angular top, and is covered with boards overlapping each other in such manner as to shoot off the wet and be waterproof.

Fig. 2 shows some of the details of the machine. A A are the travelling wheels. B is the main or middle stay, in which the axis revolves in a brass at the angle or centre of the stay. C C are two angle press wheels, having their outer edges of the form shown immediately below each wheel respectively, and in which, for a press wheel of 3 feet diameter, the following dimensions answer well, that is to say, $a\,b$, 3 inches; $a\,c$, $\frac{3}{4}$ of an inch; $c\,e$, $1\frac{1}{2}$ inches; $e\,f$, $\frac{1}{2}$ an inch. D is one of the revolving coulters, having its outer edge of the form shown below it. The revolving coulters are about four inches larger in diameter than the angle press wheels, as shown in fig. 1; they are also narrower, except at the truncated edge, which is the same width, namely, about $\frac{1}{2}$ an inch. E is one of the stops, provided with a screw, and adapted so as to be fixed to the axis, and keep all the wheels in their proper position, that is, working at right angles to the axis. F F are loose stops for filling up the space when fewer wheels than in the entire machine are used. G is also a stop to be employed between the larger discs, for the purpose of keeping them in their proper position, and insuring their working at right angles to the axis. H is the scraper for the angle press wheels, adapted so as to be reversible as either side becomes worn, and narrower scrapers are adapted for cleaning the revolving coulters; all the scrapers are fitted on the same rod and are reversible; they have steel edges, and the rod on which they slide may remain, as shown in fig. 1, or it may be fixed lower, so that the scrapers may scrape the lower part of the wheels instead of the top. The steering wheel in front of the machine has a semicircular iron above it, fastened by bolts to the frame of the machine. The wheel is worked from behind on either side by iron rods, rack, and pinion. I is the hollow coulter, through which, when placed behind the revolving coulter, the seed is deposited in the seed bed, as hereafter mentioned.

The centre holes of the angle press wheels are larger than and fit loose on the axis, and consequently rise and fall about an inch, according to the variations of the land over which they have to pass; but the revolving or wheel coulters fit close to the axis, going about a uniform depth, pressing or making the solid seed bed with the angle press wheels on each side, to assist in keeping the land close to the revolving coulters, while the latter press the land and form the solid seed bed.

When the machine is employed in rolling or drilling light land, the revolving coulters with the angle press wheels on each side (as the machine travels or is drawn on) form a solid seed bed, in which the seed is deposited from the seed box through tubes communicating with the hollow coulters behind the revolving coulters.

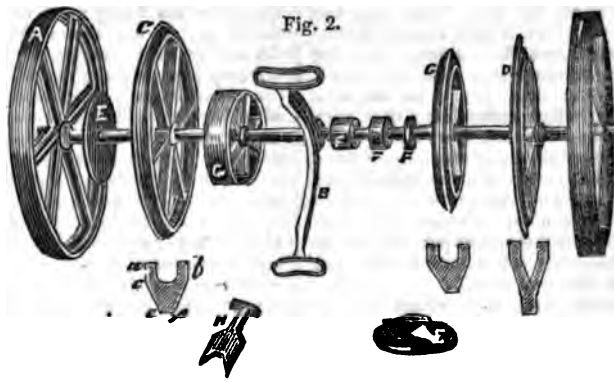
In drilling strong land, the angle press wheels on either side of the revolving coulters may be dispensed with, and collars or stops, such as F or G, placed between the coulters, to keep them in their places, at proper distances apart. If the revolving coulters be removed, and angle press wheels of suitable diameters substituted, with or without the wheels or collars, F, between them, the land may be rolled, or left in a series of ridges or angular hollows, or rolled over down each drill of growing corn.

The cup for expelling the seed from the seed box has an angular shank with the sharp edge upwards, the effect of which is, that no seed can be expelled but by the cup itself; the seed so expelled is received by a tin hopper, from which it descends into a spout or tube, and thence into the hollow coulters, which follow in the seed bed made by the revolving coulters, and from which the seed is either strewed or dropped. If dropped, it is done by means of cog wheels fixed on an iron rod or bar in front of the seed box, which cog wheels, as they revolve, press the heads of other iron bars, one being at each side of the machine, connected with suitable irons for opening the chaps or mouths of the hollow coulters, and which are closed again by a spring after the seed is deposited. When the corn is to be strewed, the lids at the mouths of the hollow coulters, to which the spring is attached, are kept open, by a hook on each side of the machine. The seed box is lifted out of its work by means of a flat bar or lever, which can be operated on from the side of the machine

behind, on which are none of the driving wheels, by pressing a handle which acts on the lever bar.

The machine, as shown, consists of sixteen discs and eight revolving coulters, but the

Fig. 2.



number of these may be diminished or increased, as required; but in the construction of such machines, the middle stay and stops for insuring the proper position and working of the discs are essential parts of the invention.

THE LAWS OF THE STRENGTH OF WROUGHT AND CAST IRON.

A paper on the above subject, was read at the Institution of Civil Engineers, on Tuesday, Dec. 9, by Mr. William Bell.

In this paper, it was stated, that the chief point had been the consideration of the longitudinal, as compared with the transverse, strength of wrought and cast iron. For this purpose the whole of the experiments made up to the present time, on tearing asunder, or crushing, bars of cast iron, and those made by breaking bars transversely, had been taken, and from them, and the known formulæ of elasticity, such values of the constants in the formulæ had been deduced, as would satisfy each experiment individually. And by comparison a general view of the accordance or non-accordance of theory with experiment had been obtained, and some general laws arrived at.

The mathematical theory of elasticity, as given by Poisson and Navier, was assumed. By finding, for each experimental beam, the centre of gravity of the area of cross section, through which, according to this theory, the neutral axis passed, and calculating the moment of the forces with respect to this axis, the application of the formulæ to the experiments was easily made.

The first constant obtained, was the weight per square inch of the modulus of elasticity, and this, when deduced from the transverse strain, was taken from the deflexions produced by small weights, and in all cases where the beam, or bar was very little strained. For wrought iron, the most comparable experiments were considered to be those detailed in the "Iron Commissioners' Report," which gave, by transverse strain from 12,200 tons to 12,750 tons per square inch, and by extension of bars from 12,200 tons to 12,900 tons per square inch. For cast iron the averages of Low Moor, Blaenavon and Gartsherrie irons were, from tension 6,305 tons, from compression 5,698 tons, and form transverse strain 5,968 tons per square inch. Other experiments on the transverse strain of wrought iron gave from 9,000 to 14,000 tons per square inch; whilst with cast iron the results were found to vary from 4,000 to 8,000 tons. On this point, it was stated, that Mr. W. H. Barlow, F.R.S., M. Inst. C.E., in some experiments on the neutral axis, recently laid before the Royal Society, found results nearly agreeing with the higher number.

Another mode of arriving at the value of the modulus of elasticity, by means of the bending or breaking weight of "long pillars," was also examined; the ratios of the lengths of the pillars to their diameters being taken as abscissæ, and the bending weights, obtained both from theory and experiment, as ordinates. It was thus found that, for the experiments on wrought iron pillars, given in the before-mentioned report, the curve of theory agreed very well with the curve of observation, until the length became shorter than seventy times

the thickness. The experiments on cast iron pillars examined were those in the second volume of "Tredgold on Cast Iron." The correspondence with theory was very good for those with the ends rounded, until the length became shorter than twenty times the diameter; and for those with the ends flat, until the length became shorter than fifty times the diameter. The hollow cylindrical pillars, with one exception—that of a short pillar—gave values for the modulus of elasticity of from 4,350 to 6,680 tons. The correspondence between theory and experiment seemed, in the author's opinion, to warrant the conclusion, that the theory was perfectly trustworthy when only small compressions and extensions were concerned.

The fundamental assumptions usually made in the theory of the strength of materials were then considered. First, that in a beam strained transversely, the extensions and compressions of the particles were proportional to their distances from the neutral axis. Second, that the extensions and compressions were proportional to the tensile and compressive forces—known as Hooke's law, and by the phrase, *ut tensio, sic vis*. And third, supposing the latter law to hold good, that whenever in a beam subjected to transverse strain, the tension or compression on the outside particles was the same as would be obtained by direct experiment on pulling asunder or crushing bars of the same material, the beam gave way. It appeared, however, from experiment, that for large compressions and extensions, the law of Hooke ceased to be applicable. It was found that, in cast iron, this law did not differ widely from the truth within the range of the experiments; whilst in wrought iron, although the difference was great near the point of rupture, yet the curve of compression was similar in form to the curve of extension, the ordinates likewise being nearly equal in amount. The true law might, therefore, be roughly expressed by saying that, beyond a given amount of force, the same force corresponded to all compressions and extensions, this force being nearly the force of rupture, either by longitudinal compression or extension: in other words, the force was scarcely altered by a large increase of the compression or extension. It was next considered what effect this deviation from the law of Hooke would have, as to the force on the outside particles, as deduced from that law; the supposition being made, that the force was constant, and therefore equal to the force of rupture for all compressions or extensions. From this investigation, the author thought it would be obvious, that the supposition of a constant force was different from the truth in one direction, while the law of Hooke was different from it in another, so that these two laws formed limits between which the truth always lay; in cast iron the latter law being more nearly approximated to. It was shown that the results derived from experiments, by assuming the ordinary law, were slightly above the truth, the difference, even in a rectangular section of wrought iron, being probably less than 20 per cent., and in cast iron still smaller, while in large box and double T girders with a broad bottom flange, the difference was practically insensible.

The other constant obtained was the value in tons per square inch of the tension and compression of the outside particles, when the beam became ruptured by transverse strain. For wrought iron the experiments on solid iron bars were fewer than could be wished, and gave results varying between 14½ and 18½ tons per square inch. In this material it was thought that it might probably be the compressive, rather than the tensile, force which determined the fracture. The only experiments on the direct compression of wrought iron were those on two bars, given in the Iron Commissioners Report—where one gave way under a strain of 14·5 tons, the other under 13·8 tons per square inch. The quality of iron was not stated, but it was believed to have been soft. It was asserted that the better kinds of wrought iron were able to sustain a greater tensile force, the worse kinds a greater compressive force. According to Mr. Eaton Hodgkinson's experiments, wrought iron might be defined to have its tensile to its compressive force, nearly in a ratio of equality; cast iron to have those forces in a ratio of about one to six. This being so, it was thought worthy of consideration, whether in the plates of a large wrought iron bridge subjected to compression, a slightly inferior quality of iron might be used, not only as more economical but as better in itself.

With regard to riveted iron, the results from all the wrought iron tubes in the before-mentioned report, gave from 7·1 to 24·8 tons per square inch. The lower numbers were apparently caused by using thin plates for tubes of comparatively large diameter. If this were avoided, it was thought that in calculating the strength of wrought iron tubes, 15 tons per square inch might be allowed for the breaking force on the outside particles.

When the experiments on cast iron were examined in this manner, the following fact became apparent; experiments on small bars broken transversely gave results of 20 tons, and even more, for the tension and compression of the outside particles, when

the experiments were examined by the ordinary theory. If these results were diminished by 20 per cent., which it appeared would more than make up the difference caused by assuming the ordinary law, there was still a result of, say 16 tons, while by direct experiments on the tensile force of cast iron, 7 or 8 tons were found to be the utmost that it would bear. In regard to this subject, Mr. W. H. Barlow had adduced the alternative hypothesis that the neutral axis shifted its position as the beam became strained, and that when rupture took place the neutral axis was "at or above, the top of the beam." This hypothesis was considered by the author to be contrary to the elementary principles of mechanics; for as the sum of the compressive forces on one side of the axis must be equal to the sum of the tensile forces on the other, therefore if there were tensions on one side of the axis there must be an area out of which to get compressions sufficient to balance them on the other. As evidence on this point, in one material, the observations of Sir David Brewster in passing polarized light through a piece of glass subjected to transverse strain were alluded to.

In experiments on the direct tensile strength, it was assumed that the outward force was uniformly distributed over the area of the bar; in other words, that the resultant of the external forces acting on the bar, passed through, and had the same direction with, the axis. This probably obtained in wrought iron from its great extensibility before rupture; but in cast iron there was no such extensibility, and this point was, therefore, to some extent, doubtful. If a few experiments were made, in which the force deviated from the axis by certain large and measurable amounts, and then were made to approach the axis, until some law was obtained which could be tested, this point would be set at rest. A table was then given, showing the values of the forces on the outside particles at the time of rupture, in tons per square inch, from which it appeared that there was a diminution as the size of the beams increased. Beams 3 inches by 3 inches, as compared with those of 1 inch by 1 inch, showed a falling off of strength to the extent of about 4 tons per square inch. The results derived from Mr. Hodgkinson's and Mr. T. Cubitt's experiments gave about 10 tons per square inch, when the sound beams only of the latter experimenter were included in the calculation, or 9·6 tons per square inch when the unsound beams were taken into account. From this table it appeared, that the breaking weight of tolerably large girders might be calculated with considerable accuracy, by using 7 or 8 tons per square inch as the force of tension on the outside particles, when rupture took place.

In conclusion the author expressed the hope that he had succeeded in establishing the following propositions:

First. That in experiments where the materials were but slightly strained, theory and experiment coincided.

Second. That where the ordinary theory was applied to the rupture of beams, and especially large beams, of wrought iron, theory and experiment practically coincided.

Third. That there appeared to be no good reason for supposing that the neutral axis shifted its position, to any extent worth noticing, even up to the time of fracture.

Fourth. That in cast iron, although theory seemed to differ from experiment, when the transverse strength of small bars was compared with the direct tensile strength, assuming the latter to be correctly stated at 7 or 8 tons per square inch, yet when the transverse strength of large girders was compared with the direct tensile strength, the coincidence of theory and experiment was nearly exact.

Fifth. That the ordinary theory of the strength of materials was more trustworthy than was generally supposed.

In an appendix, the author explained the formulæ used in examining the experiments, and gave the demonstrations of the results arrived at; the experiments for ascertaining the modulus of elasticity, and the forces on the outside particles at the time of rupture, being examined in great detail.

UNIONS AND STRIKES.

[We have been requested to publish the following letter, which is suggestive of grave considerations, and well deserves the attention of thoughtful men of all classes.]

To Leon Walker, Esq., on receiving his Pamphlet upon Unions and Strikes.

Sir,—I rejoice in every attempt to get the world back to right, as that design must be the starting point for the full play of the mind, and for all true human progress. We shall never effect much by dealing merely with the results of evil which has lasted long, and which has affinity with our lower or corrupted nature. We must go to the root of the matter. I like the "direct acting" principle, and would inquire, How comes it that such a state of things as you pourtray exists? My conviction is that it is simply because the great first

principles of our common humanity are not recognised, and therefore, of course, not acted upon; because that great fact, which I will designate "The Brotherhood of the Race," is not realised in our public thought and public action. Men never seem to feel they are workers together, but act singly, one merely working *for* another.

With these convictions, I would therefore seek to impress upon all that they are workers together with God in man's appointed course, and that mutual dependence is an unalterable and benign law.

"The king is served by the field."

I would that all should be satisfied at heart, as well as in creed, that wisdom and love, and the mighty power resulting from these, are proffered to every man who will do the will of God as far as he knows. I am no sermonizer, but I am sure that until Divine principles are more generally felt to be the spring of action, little will be done. I do not here plead for the propagation of any or all of the creeds and dogmas of sects. Would to God they were most of them swept from the earth, and that man would cultivate and act from the guidance of conscience, the recognition of which, I humbly believe, is the foundation upon which will rise a renovated world, when the throes now felt everywhere shall have delivered men from the trammels of conventionalism; when sincerity, reality, and inward self-dependence, shall be the joyous condition of our race, and when the watchword of all will be, God a Father, man his offspring, and the consequent true universal brotherhood of man. Until this is realised, life will inevitably be patchwork and a failure.

But a word or two to the point. We must begin at the beginning, and talk to employers themselves. We must refer to the time-worn schemes for keeping down the price of labour. What was the origin of slavery but this? The princely position of West India proprietors at one time, and their fourfold encumbered estates at another, alike sought support and relief by crushing labour. From a similar source springs the more refined, but not less cruel, degradation and want of our agricultural labourers. A man, wife, and three children, with rent to pay, receive eight or ten shillings a week! "Tell it not in Gath!" And amidst all that characterises our own day, either to advance the landlord or the owner to magnificence, or to patch up his changing fortunes, all available resources have been sought in withholding the hire of the labourer, whose cry has long gone upward, appended to which we now hear the plaintive note, "How long, O Lord, how long?"

Take an example. The price of iron is now good and remunerative; yet I heard the other day, at the Hen and Chickens, Birmingham, some iron masters, who thought their purposes needed no concealment, say they meant to reduce the wages, but should stop till the dead of winter, when the men could not afford a strike! Infinitely better for them would it ultimately prove, that their exchequer should have been emptied, than that they should thus prove bankrupt in the Humanities.

Look again at shipbuilders, carpenters, smiths, and others, giving apprentices two shillings a week in many instances. Fancy two hungry youths eating up daily all that a widowed mother can procure, by half starving herself and the rest, that the boys may get a trade! These are but types of the whole.

The evil is, some lead, and the mass follows; and if position, education, social influence and power in the superior classes, as they are termed, only manifests this awful selfishness, what on earth or elsewhere can be found but the evils you so fully expose, but I fear will do little to cure? Man is an imitative being, and if those who have the direction of his youth be thus selfish, to look for anything else in the workers, will but betray a lamentable ignorance of human nature. Will the lecture from the shopkeeper to his young men, primarily that they may not rob his till, make them honest, while they are taught to lie all day about the goods they sell? What we sow we reap. Hypocrisy, untruthfulness, the absence of all esteem or regard, in short the rupture of every tie by which God would successfully carry out the best interests of his human family, all proceed, in great measure, from the selfishness and misapplied influences of the bulk of those who would yet be styled the higher grades of society. Men come to care little for their masters, feeling they are only valued at what they can profit their employers per week. Especially will these fearful results be found in the apprentices, I have before alluded to. I'll warrant you, the impression of the seven years goes through life, and readily leads to the formation of unions, and to the accomplishment of strikes.

Let a fair value be set upon labour, by job work, wherever practicable. Especially let a man feel there is something beside wages for him, and that, if he deserve it, he will receive warm approbation, and the cheering words, "Well done!" If he feel this deeply and abidingly, depend on it no wretched, misguided, jobbing, robbing Union will ever deceive or bribe him, and he will feel there is no call to strike.

Let the workman's social position be regarded. Some establishments in the town in which I write, have long given up the last quarter of Saturday, and in order that it may not be at all interfered with, the accounts are closed on Friday. Men thus have a few hours afforded them for their domesticities. They now feel it worth while to clean themselves, and do themselves good, whereas, while worked and paid late, nothing desirable was left them, but the pipe and pot, away from home. The repose of the Sabbath is now less interfered with; apprentices are smart and respectable, and form quite a different class from what they were. All are more cheerful, and better prepared for the next week's work. I verily believe, after forty years of observation, that long hours never produced the results aimed at. The practice with engineers, and many others, of making five and sometimes six quarters in every day, is worthy of severest reprobation, and arises, not from necessity, but cupidity. The human energies must find equilibrium; they do so, and I am sure, though a man may not himself know it, it is a physical fact that he does no more work in making seven days out of six, in the long run, than he would do otherwise; and if any doubt it, let his cadaverous looks, his frequent illness, the destruction of his domestic enjoyments—the first gift of God, and his premature decrepitude decide the point.

For a man to be a man, he must feel, and be helped to feel, that he has far higher destinies here than to work, to eat, and to die. Once inspire him with the fact—the heaven-born truth, that he is where God has placed him; that his work is worship, if done under a right impulse, and that Duty is all Divine, and he will soon feel an elevation nothing else can give. He will come to truly estimate the relations of life, and sit and sing,

"All men are equal in their birth,
Heirs of the earth and skies;
All men are equal when that earth
Fades from their dying eyes.
Ye great, renounce your earth-born pride,
Ye show your shame and fear;
Work as ye worship side by side—
Your brotherhood revere!"

I am, Sir, yours, &c.,
AN EMPLOYER.

AUTOMATIC OR SELF-ACTING GRAIN SCALE.

AT the meeting of the Liverpool Polytechnic Society, at the Royal Institution, Colquitt-street, on Monday, Dec. 8, Joseph Boult, Esq., in the chair,

Dr. Sellers, of the firm of Sellers and Hartley, Baltic-buildings, Redcross-street, exhibited a beautiful model, in brass, of an invention which has been patented in America under the above title. It consists of a movable drum or cylinder, suspended horizontally on a platform scale, divided by a diaphragm or partition in its centre, and open in the upper portion of its circumference to admit the substance to be weighed. To the scale is attached a beam with adjustable weights. The grain or other substance to be weighed enters one side of the cylinder until the weight required (within, say, five pounds) is attained. The beam then rises, and a gate is by its motion dropped, cutting off the supply, except through a small opening, which is closed in like manner by a second gate, as soon as the five pounds required to complete the weight have entered the cylinder; simultaneously with the falling of the second gate a bolt is withdrawn, and the cylinder (in consequence of the weight of grain being on one side) rolls over, lifting the two gates by means of cams attached to its outer peripheries, and the grain is discharged by means of simple trap gates below, while the opposite chamber is filling. This oscillation, weighing, and discharging continues until the supply is stopped, and at each vibration, by means of ratchet wheels and a dial plate, the quantity discharged is registered accurately—in fact, it is a complete and perfect self-acting, self-accounting machine. In Sandusky, Ohio, and other western towns in America, Dr. Sellers observed, they had these scales of such size as to weigh and discharge 9,000 bushels per hour. The simplicity, accuracy, and rapidity of action of this scale must recommend it to dealers in grain, salt, &c., millers, maltsters, and coal miners; and perhaps might revolutionise the whole system of weighing in bulk, as well as that of warehousing, shipping, and unloading grain. In most of the grain ports of America, steam elevators were used to load and unload vessels. The floors of grain warehouses were constructed of hopper shape, to discharge the grain without handling; and after passing through one of these scales, it was shot into boats by means of tubes, that could be raised and lowered to suit tide water, or sacked from smaller scales that delivered a sack (of exactly so many pounds) at each vibration, and at the rate of eight per minute. The inventor had devoted many years of his life to perfecting this really remarkable invention, and the patents had in the brief period of one year been sold for large sums in America. The patentees were now exhibiting the working scales in Liverpool, London, Havre, and Antwerp, with a view to dispose of their European patents.

THE BELL AND CLOCK FOR THE HOUSES OF PARLIAMENT.

In reference to Mr. Loseby's remarks, which appeared simultaneously in the *Builder* and in this Magazine, on Nov. 22, Mr. Denison has written to the former journal as follows:

"Mr. Loseby's statement, that it appears from the parliamentary papers that the Westminster clock is calculated to strike the great bell with a hammer of only 120 lbs. raised 6 ins., is a pure and simple fabrication of his own, as anybody may see who will take the trouble to look at the contract, which was printed in 1852 and again in 1855. And anybody who chooses to look at my latest book 'On Clock-making' (not the rudimentary treatise, but a reprint of the article in the 'Encyclopædia Britannica,' sold at Dent's, in the Strand) will see that a hammer of 4 cwt. falling 12 ins.—nearly eight times Mr. Loseby's figures—was the least that I contemplated in designing the clock. The hammer will in fact be considerably more than this, as the bell is not only heavier, but much stronger than I ventured to expect three years ago.

"I have been wondering what could suggest to Mr. Loseby such an absurdity as the striking of a bell of 16 tons with a hammer of 120 lbs.; and perhaps this is the explanation. It does appear from the parliamentary papers he refers to, that, not before, but after the intended weight of the bell had been increased from that of the Oxford bell to 14 tons, a hammer of little more than Mr. Loseby's size was proposed, in that very plan for the clock which his fraternity, the Worshipful Company of Clockmakers, memorialised the Commissioners of Works to adopt, and to rescind (if they could) Mr. Dent's contract to execute my plan. It is only charitable to suppose that, writing with an imperfect recollection of the papers, and animated by a natural and amiable desire to pay off some old scores respecting his chronometer grievances, Mr. Loseby has, with a curious felicity of blundering, transferred the folly of the company of clockmakers to my account."

Mr. Loseby has forwarded us the following reply to Mr. Denison's observations:

To the Editor of the Mechanics' Magazine.

Sir,—After partly divesting Mr. Denison's letter of the peculiar tone and epithets which pervade it, the matter resolves itself into the following:

First, that the proportion of weight and fall given in my communication, namely, 120 lbs. for the hammer, and 6 ins. for its fall, are "fabrications" of my own, and not to be found in the parliamentary papers, unless I have, as Mr. Denison expresses it, "blunderingly transferred the folly of the company of clockmakers to his account." Second, that in designing the clock he made provision for its having to lift a hammer of 400 lbs., and give it a fall of 12 ins., and that evidence is to be found of his having long contemplated this as the least quantity of work which the clock would have to do; and further, that now the bell has been cast, he finds even this weight and fall of hammer will have to be considerably increased.

In reply to the first part, I have to state that, before writing the letter to which Mr. Denison refers, I carefully examined all the published parliamentary returns to the House of Commons, namely, No. 724, session 1847, No. 257, session 1848, No. 500, session 1852, and No. 436, session 1855, and that I have since gone diligently through them again, and the result is that I have not found any inaccuracy or error whatever in my former statement. The weight of 120 lbs. and 6 ins. fall, are neither "fabrications" of my own, nor were they quoted according to Mr. Denison's other suggestion, from the "blundering statements of the company of clockmakers," but were taken from a table given by the late Mr. Dent, at page 56, parliamentary return No. 724, of 1847, and let me add, that I purposely confined myself throughout the letter to the quantities and figures given by Messrs. Dent and Denison themselves, thinking that the latter gentleman would not then question their accuracy.

In reply to the second part, I have to observe that I can find no mention throughout the whole of the returns, either by Mr. Denison or any one else, that a hammer of 400 lbs. falling 12 inches would probably be required for the bell, which it was understood, before the first return was published in 1847, was to weigh from 14 to 15 tons. Neither has any provision been made by enlarging the clock for the enormous and still accumulating increase of work which Mr. Denison, in order to get his bell purchased by the Government, seems now disposed to throw upon it. The main striking wheel remains at 3 feet diameter, and it has never been increased beyond this size in any of the plans of Messrs. Dent and Denison from the date of the first return in 1847 to the last return in 1855, and at this date the clock had been made.

In justice to the late Mr. Vulliamy I must remark that the plan for the clock which was sent in by him, and which Mr. Denison ridicules under the title of the fraternity of clockmakers' plan, as being too small for the purpose, was larger than

any of the plans proposed by Messrs. Dent and Denison, as the diameter of Mr. Vulliamy's main striking wheel was 3 feet 7 inches. Nor is this the only advantage in durability which Mr. Vulliamy's plan exhibits over Mr. Denison's; for it had gun-metal wheels throughout, whilst the wheels in the clock that has been made are all of cast-iron, the commonest and cheapest material that could be used. Nor is this all for which the public have to thank Mr. Denison, Q. C.; for he has so managed matters that the Government will have to pay as much for the clock as though it had been made of the more durable and costly material.

In conclusion, I again set forward the principal questions to be kept in view:—

1. What is the force which the clock now made is calculated to lift? To this I reply that, taking into consideration the size of the striking part, the time it should last, and the fact of the wheels being composed of cast-iron, 120 lbs. for the hammer, and 6 inches for its fall, is the greatest quantity of work which the clock should be allowed to do.

2. What is the force which a good bell of 16 tons should require? To this I reply that, taking the Oxford bell as the standard, which weighs 152 cwt., and is struck by a hammer of 54 lbs. falling 4½ inches, and considering that Mr. Denison's bell was to have been much superior to the average quality, a hammer of 120 lbs. falling 6 ins. ought to be amply sufficient to bring out the tone.

E. T. Loseby.

London, Dec. 10, 1856.

CLIFFORD'S PLAN OF LOWERING BOATS.

We are much gratified to learn that this invention has been tested under the most extreme circumstances, both in the Royal Navy and in the merchant service, and found in every instance to answer perfectly. After receiving numerous favourable accounts of its merits, the Admiralty appointed a committee of experienced naval officers at Woolwich to examine and report upon it. To render the trials as satisfactory as possible, impediments, such as are liable to occur in ships at sea, were introduced, and yet the average time spent in disengaging the tackle and lowering the boat was but fourteen seconds. The committee have reported to the Admiralty their unanimous conviction that no captain of a vessel, either in the royal or mercantile navy, should be permitted to put to sea unprovided with the means of unlashing and lowering their life-boats according to Mr. Clifford's process. The men of the north are also taking up the invention in a highly honourable spirit. A special general meeting of the Dundee Trinity House was held recently in the hall of the Incorporation, Captain Ewing presiding. The Fraternity of Masters and Seamen passed a resolution unanimously approving of the invention, and expressing their opinion that all passenger ships should be fitted with at least one boat with the patent apparatus. Orders have since been received from Scotland to fit steamers of the Aberdeen Steam Navigation Company, the Leith and Clyde Company, the Victoria, Aberdeen, and Newcastle Company, and the Dundee and London Shipping Company. We hope English companies will not be slow to imitate the north in this matter. It is certain, however, that notwithstanding any reluctance on their part, the general adoption of the invention will be enforced before long.

IMPROVED HIGH-PRESSURE ENGINES.

An important improvement in the construction of the high-pressure non-condensing engine has been effected by Mr. Duff, of the Oakbank engine works of this city. It consists of two cylinders, instead of one, as in the ordinary form of construction. The steam from the smaller of the two cylinders, before passing into the atmosphere, exhausts itself into the second cylinder, which is three times the capacity of the first. The effect is that the steam gives three-fourths additional power as contrasted with the same volume of steam acting through the former or single cylinder engine, in proof of which the improved engine, with a cylinder of only eight inches diameter, is doing the work with greater facility than the single cylinder engine, which has one of ten inches diameter, the length of stroke and pressure of steam in both being the same. But there is in addition this most material distinction, that the improved or double cylinder engine effects a saving in fuel of about 40 per cent. So far as Mr. Duff is aware, no engine of the same peculiar form has yet been constructed. This engine is now in daily operation at Mr. Duff's works, where it has been visited by several interested in such matters, who have expressed their warm approbation of the result.—*Glasgow Herald.*

Rifled Ordnance. A Practical Treatise on the Application of the Principle of the Rifle to Guns and Mortars of every Calibre. By Δυνάμικος. London: Printed by W. Clowes and Sons, 14, Charing Cross. 1856.

It is a somewhat remarkable fact that, although rifled small arms have been introduced into the armies of all civilized nations, with highly satisfactory results, the adaptation of the rifle principle to ordnance has never, we believe, until the appearance of the work before us, been made the subject of theoretical research and extended experiment. All that has been done in the actual construction of rifled ordnance, in so far, at least, as the amount of turn given to the grooves is concerned, has been almost purely guess-work.

Dunamikos—whoever that veiled philosopher may be—has, however, opened up the subject with becoming boldness, and has obtained, as we gladly observe, permission to dedicate the results of his investigations to the Duke of Cambridge, Commander-in-Chief, a circumstance which will probably obtain for the work the consideration which it well deserves, but which, otherwise, military officers might never have been disposed to concede to it. At the same time, it is proper to state that the author, who is a civilian, is careful not to encroach upon subjects purely military. He says: "To pronounce upon the most proper method of *applying* any fresh discovery affecting that theory (of projectiles) is a subject solely for the consideration of competent military authorities; and if I have ventured to express any opinion on this point, I wish it to be understood, that it is under the correction of those who must be better aware of what is fit or unfit for practical purposes than I can possibly be." This indicates wise subservience, and will ensure respect for the author.

The limits of our space will not permit us to do more than notice the principal conclusions at which the author arrives, prefacing these with the remark that the book throughout evidences that the writer is alike capable of experimenting with care, and of applying sound mathematical knowledge, where such is necessary. The latter point is rendered additionally important by the circumstance that treatises upon military subjects are commonly very defective where mathematical investigations are introduced.

One of the chief of the author's conclusions is that the amount of "turn" which it is advisable to give to the grooves of rifled guns, or, in other words, the initial velocity of rotation which it is well to impart to rifled shot, varies according to the form and weight of the shot.

Further, as it is highly desirable, and will ultimately be absolutely necessary, to have a certain standard by which the turn in guns of different calibres may be regulated (hitherto a purely arbitrary matter), the author has instituted, and gives the result of, a series of experiments made in order to ascertain the minimum turn absolutely necessary to effect the desired objects. His conclusion on this point is, that the decrease in the turn of the rifling should, as the size of the shot increases, be as the square root of the number which represents the multiple that the diameter of the one shot is of the other. The arguments employed in reaching this conclusion are carefully detailed, and deserve the closest attention of the reader.

Another point contended for by the author is that, in order to obtain the greatest results, as heavy shells as possible should be used, the limits of their dimensions being about three diameters in length, the shell, of course, having an elongated form, and being fired from howitzers or mortars alone. With such shell the weight of the gun and the charges of powder may be reduced to a minimum.

The inaccuracy of the flight of shot which do not completely fill the gun, and in which certain other conditions are not observed, is pointed out; as are also the different curves of flight described by round and elongated shot or shell. The author further shows that accuracy of flight is of much more importance than very great random ranges, and that, since long shot move in curves which much more nearly resemble parabolas than the curves described by round shot, the former may be fired with much greater accuracy than the latter at great elevations.

It should also be stated that, in obtaining the rule above indicated for assigning the turn of the grooves to guns of different calibres, the author has taken for his guide the different effects produced by the air upon corresponding shots, which is, in fact, the only correct method, since it is these effects which alone render the turn necessary.

Beside the more theoretical disquisitions contained in the work, there are several practical improvements suggested. Among

these is a method of constructing shot with an expanding ring before the centre of gravity and another behind it, the two rings being expanded simultaneously, so as to keep the axis of the shot coincident with that of the gun in its passage out of the chase; by these means unprecedented accuracy may be obtained in firing long shot.

There is also a method of jointing the trails of field-carriages, by which arrangement all degrees of elevation may be obtained without the use of an elevating screw, thereby allowing field-pieces to be made without trunnions at all.

Although we have done but scant justice to the contents of the work before us, we have said enough to induce military men and others to take it up with interest, believing, as we do, that its perusal will be attended, in some quarters, with important results.

THE CRYSTAL—THE PEOPLE'S PALACE, SYDENHAM.

NO. I.—ITS HISTORY AND THEORY.

A German traveller, Mr. Schomburg, rediscovered a gigantic water-lily on the river of Guiana, which, being transplanted to England, attracted the notice of the mighty and rich. Mr. Paxton having to provide a *house* for this huge plant, expanded the system of cast-iron arches and girders to the construction of a whole building. And thus, when the idea of a general Exhibition of the World's Industry was proposed in London, his tardy plan, conceived at last as by inspiration, was accepted before all others, and the Crystal Palace in Hyde Park arose. Its business-like arrangements insured great success, and the visits of the *millions* resulted in a large surplus, not yet properly appropriated. But the people who live near *Rotten*-row spurned the contiguity with *the* people which they have neglected to educate, and the triumph of English thought and deed was doomed to demolition. Many, therefore, were the reasons which caused the erection of another Crystal Palace at Sydenham—the finest site near London. The idea to erect the largest structure in the world, as a recreation and instruction-place for the people, implied the acme of the aspirations of the modern times, and the apotheosis of the English nation!

Many were the inspirations, mistakes, and foibles which influenced the building of this modern Babel establishment; still, *the* one great idea towers above the whole, and constitutes it such an establishment as never existed before. Some animadvert on the simplicity (plainness) of the plan of the building; bewailing, probably, the colonnades and porticoes of temples and palaces. But they seem to overlook the great scope and destination of the People's Palace establishment, namely, to afford recreation (amusement) and instruction to, say 100,000 people, assembled simultaneously within its precincts. It will be perceived, that I lay a great stress on the *recreative* character of the Crystal Palace, and place it even before the instructional; still, it strikes one as something strange, that there exists not, within the whole range of literature, any treatise "on the *ethic, moral, ennobling* influence of art and art exhibitions (plastic, pictorial, musical, &c.) on the mind and being of the people." The first French revolution emancipated the middle classes; but the true emancipation of the bulk of the nations, is the aim of the present time; and thus it was in the order of things, that the Crystal Palace had to arise in the *British* metropolis. The character of this nation is entirely misunderstood, even by those who ought to study and to know it. With all the drawbacks (degradations) incidental to other circumstances, it *is* a nation, which has had a Shakspeare, a Cromwell, Milton, Newton, Handel, Bolingbroke, and Noel Byron within her ranks, and the influences of these will ever run in its very veins. A nation which has had great antecedents, must have a great futurity. However this may be, in building up a theory of the future of the Crystal Palace, we must remember, that when the Polka composer Jullien gives a *Beethoven* festival, the hugest theatres of London are crowded to suffocation by a respectable, orderly *Shilling* audience. There are hundreds of thousands of persons of the middle and working classes in and around London, who pant after some reasonable, intellectual, cheerful amusement, and all the early closing and other *movements* are in danger of proving only deceitful shams, as long as *that* is not provided for, increasing the frequenters of tap and worse rooms. But to place the People's Palace in that prominent, national situation, two things are required:

1. The Crystal Palace must be an establishment not stationary, concluded, as it were, but one teeming with movement and novelty.

2. It must be so arranged, that with the exception of the admission shilling, and a fair fare (quantities *constant* and *given*) the visitors of any rank of society will be accommodated there as if they were in London.

J. LOTSKY.

15, Gower-street, London.

(To be continued.)

THE VAPOURLESS GLOW-HEAT DISSEMINATOR.

To the Editor of the Mechanics' Magazine.

SIR,—The construction of gas stoves having for many years past occupied a large share of my attention, my curiosity was strongly excited by your notice, at page 486, of a *novelty* in this line, under the fanciful title of a *glow-heat disseminator*. As I could form no idea of what a *glow-heat* (shining—or red heat) *disseminator* could be, I procured a copy of Messrs. Wessel and Kukla's recently enrolled specification, the contents of which I found scarcely less remarkable than the title of the invention. The patentees describe their invention as consisting of "an apparatus in which the *perfect combustion* of gas, oils, spirituous liquids, or other heat-producing substances, is obtained by intruducing atmospheric air in the focus of the flame, by which a higher *oxydation* of the products of combustion takes place. At a proper distance over an Argand gas or oil burner, is fixed a metallic conical or round body, for the purpose of dividing the flame, so that it assumes a radiating position, and thereby permits the oxygen of the air to mix freely with the flame."

This mode of obtaining perfect combustion, is neither more nor less than the principle of the *solar lamp* applied to heating purposes. In the earlier solar lamps the oxydator employed was a circular plate externally concentric to the flame. Latterly, and more particularly in the camphine lamps, the *oxydator* has consisted of a conical or other metallic button placed in the centre of the burner, causing the flame to diverge and radiate, in the manner and for the purpose stated by Messrs. Wessel and Kukla. This mode of obtaining perfect combustion was patented by Mr. Jeremiah Bynner in 1837, but his patent was annulled by the Court of Queen's Bench in June, 1842.* This principle was then stated to be "the introduction of atmospheric air at a point below the point of combustion, and the deflection of the air by means of metal or other deflectors upon the flame at a point above the point of combustion." It was held, however, that this was no novelty, for that the application of atmospheric air in the way described in Mr. Bynner's patent, had been long known and practised, and great numbers of lamps had been made upon the same principle. What was *old* in 1837, can hardly be *new* in 1856!

Messrs. Wessel and Kukla describe an apparatus in which an Argand burner is made use of, but they do not restrict themselves thereto, using "as occasion requires, other kinds of burners of whatever name." The *oxydator*, too, may be of any form or material, and the patentees go on to say, "Our arrangement of the apparatus ensures a considerable and rapid induction of the atmospheric air to the focus of the flame of a gas or oil burner, and by placing the solid body (the *oxydator*) at a proper distance from the burner, we permit the separation of the flame to take place, in order that it may freely radiate horizontally underneath the oxydator, by which process the atmospheric air can exercise on the flame the greatest possible action, furthering the immediate perfect combustion of the products of combustion (smoke and vapour). The glow-heat is by atmospheric draught carried upwards through the cylinder (case of the stove) for diffusion in the space, which latter then is quickly warmed. The same atmospheric draught causes at the same time a circulation of the warm air in the to be heated space, so as to press the colder air downwards and obliging the latter to enter into the lower openings of the apparatus attracted by the heat, and to undergo in its turn the same process. The circulation begins with the lighting of the flame, and continues whilst the apparatus remains heated." The patentees claim as one of the merits of their invention, the intensity of the combustion which results from their arrangement, whereby the unwholesome atmospheres of hospitals, churches, &c., will be *attracted* and rapidly *decomposed!* The apparatus is called *Vapourless*, but is furnished with a special provision, in the shape of a water-receptacle "from which a desirable quantity of evaporated moisture (vapour) is obtained."

The patentees claim "the construction of the said apparatus for the perfect consumption of combustible materials, as well as for the perfect consumption of the products of combustion of the flame (smoke and vapour)." If the combustion be *perfect*, whence the products—smoke and vapour?

They also claim "the employment of a water-receptacle for household purposes, as well as for giving a desirable quantity of moisture to the atmosphere, united with general heat."

Lastly, they claim "the property of our said apparatus as regards a circulation of the atmosphere in spaces by the process above described"!!!

The principle of intense combustion in gas-stoves for the diffusion of heat is, in my opinion, a great mistake. I have long advocated the opposite principle, namely, the employment of a larger mass of matter

* *Vide* report of trial in *Mech. Mag.*, vol. xxxvii., p. 47.

in conjunction with the flame, so as to obtain the greatest possible amount of heating surface at so low a temperature, as to guard against the *decomposing property* which Messrs. Wessel and Kukla consider an advantage in their glow-heat disseminator.

All my own experiments in this direction, have been most satisfactory, and so far as manufacturers of gas-stoves have approximated to this arrangement, just so far have they succeeded in producing a pleasant and healthy heating medium.

Both these patentees are foreigners, and although one of them is a Doctor of Philosophy, the foregoing quotations will lead to the belief that his acquaintance with the English language as well as with the technicalities of English science, is exceedingly imperfect. The construction and language of the specification are open to serious objection, legal and otherwise; there are eleven drawings attached to this document, not one of which is numbered; five of them are without a single letter of reference, and in some of the others the letters of reference are misplaced. The patentees appear, as I think most unwisely, to have dispensed with the aid of a properly qualified patent agent, by which means they have saved the "agency fees;" but, as an almost inevitable consequence, they have expended a large sum in "office fees" for a piece of parchment, and a wax medallion, which is in my opinion *perfectly valueless!*

I am, Sir, yours, &c.
WM. BADDELEY.

Angel-terrace, Islington, Dec. 9, 1856.

IS AERIAL NAVIGATION PRACTICABLE?

To the Editor of the Mechanics' Magazine.

SIR,—The machine which I proposed in 1847-48, in the columns of your Magazine, as adapted to the purposes of aërial navigation and which was called by the name of the "Archimedean balloon," is substantially the same as that which I now propose for aërial purposes. This is particularly true with regard to the plans published in the latter year, and which will be found to differ considerably from those of 1847, in regard to the arrangement of the several parts, though the principles are the same.

The leading features in the construction of the Archimedean balloon are these:

1st. An elongated frame work, having four paddle-wheels, arranged two abreast. These paddle-wheels are so contrived as to beat the air only through a certain arc, which arc can be readily shifted, so as to produce a propelling power in any direction in a vertical plane. The paddle-wheels are to be set in motion by an engine, and a man's hand may regulate the position of the arc of impact.

2nd. An Archimedean screw is to be placed at the fore-part of the elongated frame work or hull, the screw having its axis at right angles to the longitudinal axis (or keel) of the frame work (or hull). The screw is to be in connection with the engine, so that it may be made to rotate one way or the other, or may be left stationary, at the pleasure of the steersman. According to the direction in which the screw rotates, it will turn the axis of the hull to the right or the left, so as to bring the entire machine into the desired position in a horizontal plane. The prow of the machine being thus pointed in the required direction, it is the office of the paddle-wheels to give the balloon a progress in that direction. The compound motion to be produced by the simultaneous action of the paddles and the screw, will be a motion in any direction in any plane.

3rd. The balloon is to be in the form of a cylinder, having hemispherical extremities. It is to be arranged parallel with the hull, and at as slight an elevation above it as may be practicable, the balloon and the hull to be connected by ropes. This balloon is to have diaphragms or internal partitions, to prevent the gas from rushing to one end of it, so as to disturb the equilibrium.

4th. The balloon is to be of such a magnitude as to contain sufficient gas to counterbalance nearly the whole weight of the machine, including the engines, frame work, crew, passengers, stores, envelope, rigging, &c. The remaining dead weight is to be less than the power of the engines, so that the paddle-wheels may be able to lift and propel the entire machine. The balloon thus acts as a counterbalance, the active lifting power being in the action of the paddle-wheels.

5th. The entire apparatus, when on the earth, is to be supported on wheels placed under the hull, such wheels having large springs, and each wheel having a short independent axle. The balloon is to ascend and descend obliquely with the horizon, the angle varying but little from the horizontal. The flight is to be no higher than is absolutely necessary for clearing terrestrial obstacles. In ascending and descending, and in all its movements, the machine is to retain a horizontal position.

Other features might be enumerated, but the above will suffice for the present.

The main question appears to be this: What is to be the power that is to move the paddles? I am not prepared to admit

that the steam-engine is inapplicable to the purpose, but certainly its ponderous nature, and the bulk and weight of the accompanying fuel and water, present some serious objections to the use of such a motive power.

Such being the case, I propose the use of the engine which I trust I have succeeded in inventing, and to which I alluded in my preceding article. This engine appears to have all the power of the steam-engine, without its furnace, boiler, or steam-chest. In the case of my engine, the power is generated in the cylinders, and the extent of that power is only limited by the strength of those cylinders, of which I require four for the perfect working of the engine. The cylinders do not require to be any longer than those of the steam-engine. The expense of producing the power is not likely to be more expensive than in the case of the steam engine itself.

The possession of this invention gives me the command over the invention of the Archimedean balloon. For even supposing that the said balloon may be propelled by the steam-engine, the engine which I propose is likely to be far more efficient.

Nor is my engine the only thing by which I have an advantage for aërial purposes. I have invented another contrivance, of great simplicity and almost unquestionable efficacy, which is adapted to all flying machines and navigable balloons, and without which they will be exceeding dangerous and almost useless, as I am prepared to show in my next article.

I remain, Sir, yours, &c.,

J. PITTER.

254, High-street, Borough, Southwark,
December 9, 1856.

FACTS AND FANCIES.

To the Editor of the Mechanics' Magazine.

SIR,—Although it seems to me that a careful perusal of my original article on "Facts and Fancies" would save "Disciple" all his queries, yet I will not appear supercilious or uncourteous by referring him to that article as my only reply, nor will I give him any further opportunity to say, however unfairly, that I am unable to grapple with the objections that have been urged.

In the first place, I do not pretend to say that the theories of attraction and gravitation are false. I only say that they are theories, and are not facts. My argument is this: that if we desire to theorize, we should first of all obtain our facts, and should be careful that we theorize upon actual facts, and not upon a mixture of fact and theory. "Disciple" seems to find that I have sinned against my own rule, by alluding to the "bog-gas" as he terms it. But the spontaneous ignition of the gas evolved from stagnant pools, is surely a fact which does not depend upon my bare word? And if I answer all the questions of "Disciple" as to the nature of this gas, what would that prove as to the soundness of the principles upon which I have required that philosophical researches should be conducted? Or if I fail to answer his questions on this head, what does it prove against me? The fanciful idea of the Will-o'-the-Wisp was only introduced by me as an illustration of how the uneducated mind will seek a cause for a remarkable phenomenon in nature. The destruction of an illustration is not the uprooting of an argument.

Nor do I object to the language of theory when used avowedly as such. I only object to a statement of declared fact being leavened with undeclared theory. I have in this way argued that the following sentence is not a correct statement of "fact:"

"If either pole of a magnet be brought near any small piece of soft, unmagnetic iron, it will be found to attract it."

I have demurred to the introduction of the word "attract" in this sentence, as being a theoretical term. I have stated that the bare fact is this, that the iron will "approach" the magnet. From the form in which the sentence is couched, I take it as meaning that the magnet is held in the hand. Were the magnet, as well as the iron, free to move, I should say that the two would "approach" each other.

"Disciple" seems to think that I am starting a theory on this point. But I appeal to your readers whether I am uttering any theory, in saying, that the magnet and the iron "approach" each other?

In the next place, "Disciple," having fastened upon me a theory of "approachtion," which is an invention of his own, asks me to explain how it is that, under certain circumstances, a magnet will prevent motion! But why am I to give any such explanation? I have simply to show how theory can be dispensed with in the statement of facts. I merely propose that when the materials do not move they should be said to be "stationary." *Why* they are "stationary" is a matter of theory, upon which I can theorize at the proper time with much pleasure, but this is not the proper time for such exercises.

In describing the difficulty of removing a piece of iron from a magnet, "Disciple" may very properly state, as he has done, that "it requires more force to lift a piece of iron from off a magnet than from off a piece of wood." But I am not bound to give him a reason for this phenomenon.

Nor am I bound to show how one fact harmonizes with another. I want the "facts" stated first, and we will take the "fancies" afterwards. Theories may be true, but they must be treated as theories.

In all this article I have stated nothing more than in my first. But I have been compelled by the pertinacity of "Disciple" to present my views in immediate juxtaposition with his own, and I trust that, as you have given space for his queries, you will be able to find room for my reply, though I should have liked to have seen you spared the trouble of both.

I am, Sir, yours, &c.,
J. PITTER.

254, High-street, Borough,
Dec. 13, 1856.

[The correspondence on the above subject must end here.—ED. M. M.]

THE PREVENTION OF ROBBERIES ON RAILWAYS.

To the Editor of the Mechanics' Magazine.

SIR,—The gold robbery is suggestive of a mode by which, in railways trains, this may be rendered impossible. Let the receptacle for valuable goods be made of boiler plate, and the door so placed that a motion from the wheel of the carriage shall be always rotating over the key-hole, which may be placed at the side so as not to be in the way of opening the door, as the lock may be placed so as to lock into the door instead of locking as usual into the side. It would not be impossible to adopt means to keep up this rotatory motion even when the train is stopping. This is a matter for the engineer. If this plan meets your approval, the insertion in the *Mechanics' Magazine* may prove a *prevention* of crime, and security to valuable property in transit.

I am, Sir, yours, &c.,
T. H.

ELECTRICAL MACHINE.

To the Editor of the Mechanics' Magazine.

SIR,—In a treatise on electricity (Mr. Bakewell's) mention is made of an electrical machine made of gutta percha, but the author states that he has never seen it in action. Could any of your numerous readers give me any information on the subject?

J. B. T.

Dec. 8, 1856.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

RICHARDSON, R. *Improvements in railway switches.* Dated Apr. 14, 1856. (No. 884.)

The patentee constructs the tongue rail of the switch of a double-headed or other form of rail, the end of which is bent downwards, and also bent towards the main rail, so that the upper part of the tongue rail passes partly under the upper table or flange of the main rail. One side of the upper part of the tongue rail may be sloped off or removed, by planing or otherwise. When double-headed rails are employed, both flanges of the tongue rail may pass under the corresponding flanges of the main rail. By this construction a strong tongue rail is obtained.

DAVIES, G. *Improvements in the method of soldering or uniting cast iron.* (A communication.) Dated Apr. 14, 1856. (No. 885.)

This invention relates to soldering or uniting large masses of cast-iron, such as cylinders or "rolls" for rolling iron, conduit pipes, shafting, &c., either when they have become broken or are otherwise required to be united, and cannot be described without engravings.

COULON, L. P. *A new type-distributing and composing machine.* (A communication.) Dated Apr. 14, 1856. (No. 886.)

This invention consists in an improved machine for distributing and composing type simultaneously. To compose with it, it suffices for the workman to strike with the finger the keys of the keyboard, and while composing, the workman has only to move the pedal with his foot to perform the distribution. This pedal puts in motion the wheels of the machine, and the distributing apparatus supplies the number of letters necessary for the composition. The machine cannot be described without engravings.

BARRANS, J. *Improvements in constructing steam engines.* Dated Apr. 14, 1856. (No. 888.)

This invention was described and illustrated at page 505, of No. 1738.

LISTER, S. C. *Improvements in spinning.* Dated Apr. 14, 1856. (No. 889.)

It is usual for the spindle of spinning machines to run in a brass foot. Now, the patentee proposes to hold it by brass necks, and to have the foot rest upon glass or glazed ware, or upon metal, and so arranged that the least movement of the bar upon which the spindles rest will give a fresh bearing to the foot of every spindle resting upon it. He also makes the necks in two halves, and placed in such a way that, as they become worn, they can be readily adjusted. Another improvement consists in making the top of the spindle to run in a neck somewhat similar to what is now done in slubbing frames only. He also makes the flyers hollow, to give lightness and strength, and when running at a high velo-

city places a steel ring round both flyers to prevent the centrifugal force from throwing them out. The invention also comprises other features.

WARREN, W., and W. DE LA RUE. *An improvement in the manufacture of envelopes.* Dated Apr. 14, 1856. (No. 890.)

In place of making up envelopes of plain paper, the interior surfaces are broken up by being printed or ruled in or with patterns with colours different from that of the paper, by which on looking through an envelope from the exterior, even though the paper may be to a considerable degree transparent, the pattern produced on the interior surface renders the whole interior confused, and prevents any part of the enclosed letter being read through the envelope.

LISTER, S. C. *Improvements in weaving.* Dated Apr. 14, 1856. (No. 891.)

This invention consists in passing warps of cotton, wool, flax, or other fibre through water, or oil and water, or otherwise wetting them before going through the slay, as such warps are very much stronger when woven wet.

KABERRY, L., and A. HORSEFIELD. *Improvements in moulding for casting certain parts of machinery, used in the preparation and spinning of cotton and other fibrous materials.* Dated Apr. 14, 1856. (No. 892.)

This invention relates—1. To the casting of spindle rails, the objects being to avoid the necessity of planing the surfaces of those projecting parts to which the spindles are adapted, and also the boring or drilling thereof. The patentees provide a pattern accurately planed, so that its upper and lower faces will be in contact with two portions of a mould box when placed together; the intervening parts are then rammed in the usual manner with sand, the pattern is removed, and the melted metal poured in; the surfaces of the required casting will be produced against the smooth parts of the box, which will act as a chill. To avoid boring or drilling, they adapt metal pins at suitable places, which pins are supported by screws passing through the box, and constitute cores around which the melted metal flows. 2. To the casting of roller beams, rails, or other such parts, and consists in a method of loosening the pattern when in the sand. The patentees adapt to the pattern a rod, which extends through the end of the mould box, and is there capable of being adapted to an eccentric, by the turning of which the pattern may be caused to be loosened in the sand.

NEWTON, A. V. *Improved machinery for felting hat bodies.* (A communication.) Dated Apr. 14, 1856. (No. 893.)

This invention relates to the arrangement, in a suitable frame or vat, of a set of felting rollers, in such a manner as to form between the said rollers a chamber for receiving the hat bodies when rolled up, after having been partially felted by some previous operation. By a rotary movement of these rollers, while the hat body is in the chamber, the necessary action is produced on the hat body to effect the felting process.

NEWTON, A. V. *An improved mode of constructing grate-bars.* (A communication.) Dated Apr. 14, 1856. (No. 894.)

This invention has for its object the casting of grate-bars free to yield to expansion and contraction, but that shall not warp, or get out of their places from any cause whatever. The invention consists in casting on the bars suitable projections, or projections and depressions, which will permit of the bars interlocking one with the other.

FORBES, H. F. *Improvements in breech-loading fire-arms and ordnance, and in projectiles used therewith.* Dated Apr. 15, 1856. (No. 895.)

These improvements consist—1. In terminating the breech end of fire-arms with a cylinder eccentric to the barrel, and in inserting within this cylinder a screw, its centre corresponding with that of the cylinder, and its diameter being more than double the diameter of the bore. This screw is bored through eccentrically, so that when screwed home the solid part of it closes the bore of the barrel, while part of a contrary turn from this position will bring the hole to correspond with the bore. The screw projects beyond the cylinder to admit the insertion of a handle, by means of which the screw is moved. 2. In projectiles to be used with such fire-arms, the head of which is heavier than the tail.

SMITH, W. *Improvements in the manufacture of steel wire for musical and other purposes.* Dated Apr. 15, 1856. (No. 897.)

These improvements relate to the processes of annealing the steel, and have for their object a rapid and uniform heating of it to redness when in a mass, and consists in so arranging the parts of the annealing furnace that the fire is prevented acting directly upon the steel, and the heat is obtained by radiation. When heated to the extent desired, which usually occupies from six to ten minutes, the mass is plunged into oxide of manganese, and then goes through the usual process of drawing to reduce it to the size required without further annealing.

JEFFRIES, T. *Improvements in cooking-stoves.* Dated Apr. 15, 1856. (No. 898.)

This invention relates principally to those metal stoves which are complete in

themselves without any brickwork setting. To heat the oven the flue conducts the products of combustion up over the top of the oven (which is immediately adjoining the fire), then along underneath the bottom of the oven, and thence by a return flue, external of the before-mentioned flues, away to the chimney; or it may pass away in part by a flue at the end of the oven, or the end of the oven may form part of the descending flue. Thus the oven, with the exception of the door, is surrounded, or very nearly so, by heat. To equalize and prevent excessive heat where the oven is in contact with the metal plates, the patentee interposes double plates, having an air space between them. This is also the case with some parts of the flues. The top of the stove is formed with loose pieces or plates to fit in and between the holes for the reception of the saucepans, which loose pieces can be removed and form openings to receive saucepans of larger size. A further improvement consists in forming fire doors just above the bars and the fire, which can be open to reduce the draught, and for throwing on fuel.

SOUTHBY, E. R. *An improvement in coating iron with copper.* Dated Apr. 15, 1856. (No. 899.)

The surface of the iron is first cleansed, then boiled or heated, then immersed in an alkaline solution, or a solution having an alkaline reaction on test paper, and then coated by depositing copper thereon, by preference from a hot cyanide solution of copper.

FULLER, W. *Improvements in ice-pails.* Dated Apr. 15, 1856. (No. 902.)

In the improved ice-pail the patentee makes the vessel that contains the liquid to be frozen in the shape of a bowl with a curved bottom, so that when the bowl is rotated the liquid will be thrown round the bottom and sides of the bowl in a thin film.

ROUTLEDGE, W. *Improvements in the construction of steam engine and other boilers to prevent explosions.* Dated Apr. 16, 1856. (No. 903.)

This invention was described at page 176, of No. 1724.

PRIESTLEY, F. *Improvements in pianofortes.* Dated Apr. 16, 1856. (No. 905.)

This invention has reference—1. To the "action" of a pianoforte, and consists in making it with a rocking lever or butt to each key, such lever or butt being constructed with a hammer-shank and hammer, and so shaped (and the back end of the key also so shaped) that the pressure of the finger on the key will cause the hammer not only to strike the string, but also to recoil therefrom, and to remain at any required distance from, but near to the string, so that, on releasing the finger and again quickly pressing the key, the hammer will again distinctly strike the string and repeat the note. It consists—2. In a modification of this improvement by the intervention of a block or sticker between the back end of the key and the rocking lever or butt; in such case, the top end of the block or sticker, instead of the back end of the key itself, is so shaped as to act upon the rocking lever or butt. 3. In constructing pianoforte actions, either as firstly or secondly set forth, with a spring, serving not only to cause, or assist in causing, the back motion of the hammer, but also to keep the rocking lever and key, or the rocking lever and the block or sticker, constantly in contact with each other. 4. In supporting the belly and belly bridge, either directly or partially, by or from the strings by means of the bridge-pins; and also constructing a belly so supported with the belly disposed at or upon, or so as to form, its bottom edge.

WHITE, D. B. *An improvement or improvements in cylinder pistons or plungers.* Dated Apr. 16, 1856. (No. 906.)

This invention consists in constructing pistons or plungers which are composed of framing and elastic packing with the framing adjustable, in such manner as to cause a lateral or outward expansion of the elastic packing, either by compression between plates or frames, or by a direct extension of the packing without compression.

NEWTON, A. V. *Improvements in fire-arms and powder-flasks.* (A communication.) Dated Apr. 16, 1856. (No. 908.)

This invention was described and illustrated at page 529, of No. 1739.

NEWTON, W. E. *Improved apparatus for raising sunken vessels and increasing the buoyancy of floating vessels.* (A communication.) Dated Apr. 16, 1856. (No. 909.)

This apparatus consists of two watertight hollow floats or tanks, each complete in itself, or constructed in two or more sections, one adapted to fit the bow and the other the stern of a vessel, the said floats or tanks being provided with suitable tackle to connect them together and confine them to the vessel, and also with suitable adjustable chocks for receiving the downward pressure of the vessel through iron plates or wooden blocks bolted at its sides. The floats or tanks are floated near the vessel, sunk by filling them with water, drawn into close contact with the bow and stern, secured together and to the vessel, and then their chocks are brought into action. The water is afterwards pumped out of them, and they float and buoy up the vessel.

JOHNSON, J. H. *Improvements in cleansing and hulling grain and seeds, and in the*

machinery or apparatus employed therein. (A communication.) Dated Apr. 16, 1856. (No. 910.)

This invention consists, according to one arrangement for treating dry grain, of a frame fitted at the top with a regulating hopper, into which the grain is placed, and from which it falls on to a vibrating perforated plate which answers the purpose of a smut machine, and removes the small grits, &c., which might require the hulling mechanism. The grain, after falling through the perforated plate, enters a fixed drum, the internal sides of which are lined with iron or steel plates roughened like a file, the cuts being V-shaped, or in zig-zags. Inside the drum rotates a beater composed of curved blades also fitted with roughened plates, by the action of which the grain is partly hulled. The hulling is further carried out in a second huller similar to the first, on leaving which it is removed by a fan or blower, the blades of which are adjustable, so that different strengths of blast may be given. On passing through the current of air thereby generated, the grain alls through an opening upon an endless ravelling belt fitted with brushes, which rub against a set of roughened plates, thereby removing any remaining skin or husks. Vibrating sieves serve finally to separate the loose husks from the grain.

ARMITAGE, W., and H. LEA. *An improvement in the manufacture of iron.* Dated Apr. 16, 1856. (No. 911.)

This invention relates—1. To the manufacture of cast iron as reduced from its ores, and consists in combining and introducing steam along with cold blast into the smelting furnace, for the purpose of getting rid of a great portion of the sulphur, phosphorus, carbon, and other impurities contained in iron, and thus purifying the same during the smelting thereof. 2. To the further purification of the iron smelted as above stated, after it has been run into pigs in a refinery furnace with steam and cold blast, as above stated, for the purpose of preparing the iron for the puddling furnace. The iron thus manufactured is free from blisters, and is also tougher, denser, and better adapted for the use of boiler makers than boiler plates as heretofore manufactured.

LITTLE, W. *Improvements in lamps for burning paraffine and bituminous oils or naphthas.* Dated Apr. 16, 1856. (No. 912.)

Each lamp is made with one or more wick tubes, and each tube is filled with a wick of cotton. The wicks are not consumed as in oil lamps, but only require that the small portion which is charred should at long intervals be scraped off the top. When a lamp has only one wick tube, there is placed over the upper end of such tube a hollow cap open below, and it has a hole through it at its upper surface. Atmospheric air passes through small perforations below the gallery into the interior of the cap, and up with the flame through the hole in the cap. The wick is raised and lowered by a pinion acting in a rack formed on the tube which contains the wick. A glass chimney is placed in the gallery which carries the cap, and the arrangement is such that the supply of air to support combustion comes all into and through the cap.

SCOTT, H. Y. D. *An improved mode of manufacturing cement.* Dated Apr. 17, 1856. (No. 915.)

This invention will shortly be described.

JOHNSON, J. H. *Improvements in the manufacture of tyres.* (A communication.) Dated Apr. 17, 1856. (No. 916.)

These improvements consist—1. Of a mode of rolling the iron, and of stamping it into suitably shaped matrices for tyres. 2. Of a mode of forming wheel tyres, without any welding whatever, from rough blanks, rolled directly, without hammering of any kind. 3. Of a construction of rolls, worked either vertically or horizontally, for rolling out the blanks into wheel tyres. The rough blank for the tyre is formed of a bar of a flat rectangular section, or of a section approaching the form of the tyre, that is, with a shoulder on one edge to form the flange of the tyre. The bar is raised to a welding heat, and coiled in a volute form round the conical end of a roll, and then withdrawn therefrom. A ring is then formed out of a bar having a wedge-shaped section, and placed in the central aperture of the blank, with its thickest side on the side of the blank from which the flange of the tyre is to formed. The whole is now brought to a welding heat, and placed in a matrix having the exact form of the finished blank, and is subjected to stamping.

MESURE, L. *An improvement in watches.* Dated Apr. 17, 1856. (No. 917.)

This invention consists in fixing on the barrel containing the spring or wheel, a wheel of sixty or more teeth, to work on a pinion fixed on the axis of what is called an "eight-day wheel" of seventy or more teeth which works the centre wheel. The fuzee and chain are dispensed with. The object of the arrangement is to produce watches which shall go for eight days instead of one.

WRIGHT, J. S. *Improvements in the construction and ornamentation of belt or band fastenings.* Dated Apr. 17, 1856. (No. 920.)

This invention consists—1. In making belt or band fastenings reversible. 2. Of a certain improvement in or additions to

belt or band fastenings, which cannot be described without engravings. 3. In ornamenting belt or band fastenings by the use of papier maché, leather, textile fabrics, coloured or enamelled tin plate, zinc, or tinned zinc, and galvanic deposits.

LÜRIG, G. *Improvements in the process of manufacturing saltpetre.* Dated Apr. 18, 1856. (No. 921.)

This invention consists in manufacturing saltpetre by using common potash of commerce (carbonate of potash), alkaline sulphates, nitrate of soda, and quick lime in variable proportions.

WESTLEY, W. *A new or improved nail or spike.* Dated Apr. 18, 1856. (No. 922.)

This invention was described and illustrated at page 486, of No. 1737.

TYTHERLEIGH, W. *A new or improved method of coating or covering iron or articles of iron with copper or alloys of copper.* Dated Apr. 18, 1856. (No. 923.)

This invention consists in coating or covering iron by immersing and agitating it in fused copper, or alloy of copper, or by putting the copper or alloy on the iron or article to be coated, and submitting the whole to heat until the copper or alloy has fused thereon, a suitable flux being employed in either case.

MARSH, J. *Improvements in fire-grates.* Dated Apr. 18, 1856. (No. 924.)

This invention consists in the combination of openings at the back of the grate, with a valve or door over the fire, the valve or door and the opening communicating with the chimney.

HOLLINGWORTH, T. *Improved machinery for dusting or cleaning rags.* Dated Apr. 18, 1856. (No. 927.)

This machinery consists of a casing, in which the rags are confined, and are operated upon by a series of beaters, consisting of arms extending from a horizontal central shaft, to which rapid rotary motion is communicated. The casing has also rotary motion communicated to it, and is provided internally with horizontal bars, which, as the cylinder rotates, carry round the mass of rags slowly, while the beaters, by revolving at a much greater speed, beat up the rags, and knock off any dust or dirt that may adhere to them. The casing is covered with wire gauze, or perforated material, which will allow the dust or dirt to pass through and away.

SCOTT, U. *Improvements in metal fittings for furniture.* Dated Apr. 18, 1856. (No. 928.)

These improvements consist—1. In making curtain rings thus:—Instead of taking a tube to make a ring, the patentee only takes one half, and bends it round a mandril. He then fastens the ends together when made of brass, copper, or zinc, with solder, or rivets them when made of iron, or stamps them out of sheet metal; then vitrifies, enamels, or japans them, when made of iron, the others he finishes in the usual way. He then takes a cord of any soft material, or a band of felt, cane, wicker, gutta percha, or other material, and fits it inside of the ring, which will keep inside of the hollow formed by the half tube. He then makes a hole through the ring and the cord or other material; and passing the eye through them, places a washer at the end of the eye, and rivets them as usual. 2. In making cornices, poles, and ends of metal, in combination with other material. The cornices he makes of stamped sheet iron; he then enamels, vitrifies, or japans them. The poles he makes of sheet iron, and the ends also. He loops the edges of the poles together, and the ends of the poles he stamps out. He then enamels, vitrifies, or japans them. He also adopts a contrivance to prevent vibration in them. 3. In certain methods of making castors and the wheels of castors of metal, in combination with other materials.

WALKER, T. *Improvements in governors or regulators of steam and other motive-power engines.* Dated Apr. 18, 1856. (No. 930.)

These improvements relate to the adaptation of the motion obtainable by the rotation of vanes or blades (affixed at an angle to an axis similar to the blades of screw propellers), in water or other fluid, to operate by suitable gear upon the throttle or other supply-valve of the engine to regulate or govern the speed of such engine.

THOMPSON, G. *Improvements in instruments or apparatus used in drawing or marking with crayon, black-lead, or other such materials.* Dated Apr. 18, 1856. (No. 931.)

This invention consists in providing for such cases an internal metal tube of the form of the crayon (or other material) employed, and, when required, the patentee forms such internal tube with a slit in the direction of its length, for the passage of the forcer, by which to move forward the crayon for use, as the point of it becomes worn away. The outer end of the tube, or that at which the crayon projects for use, is slit in several places, to admit of an elastic holding of the point of the crayon.

JEFFREYS, J. *Improvements in instruments for aiding respiration.* Dated Apr. 18, 1856. (No. 932.)

1. The patentee employs, for the metal fabric of the operative part of the instrument, flattened spiral coils of wire, between the coils of which the currents of the breath pass transversely. All horizontal wires arresting the descent of moisture is thus avoided. 2. He renders the warming power

of the instrument variable in every degree desirable, by rendering variable at will the distances between the parallel wires themselves of each layer. Where perforated metal plates are employed, he varies the apertures by causing the plates to slide over each other. 3. In the form of respirator, patented by him in 1850, in which the currents of breath are made to traverse longitudinally through the course of metal, and parallel to their direction, he employs cylindrical or flattened coils of wire, plain or twisted, and known as bullion, to form flexible tubular passages along the hollow spaces, of which the currents pass.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

BRADEN, G. and C. *Improvements in the manufacture of show tablets for advertising purposes.* Dated Apr. 14, 1856. (No. 881.)

This invention consists in forming the letters or other devices, as well as the border or frame thereto, by stamping in thin metal (copper or tin by preference), and in producing variations in colour by enamel, japan, &c.

BRIDGWOOD, J. *An improvement in the manufacture of China and earthenware plug wash-hand basins.* (A communication.) Dated Apr. 14, 1856. (No. 887.)

This invention consists in forming the hole at the bottom of a washhand basin to receive the plug without any metal socket, and in forming the plug of china, earthenware, or glass, and fitting it by grinding it in the hole.

OLLEY, W. H. *Taking photographic impressions or pictures of microscopic objects by reflection, such reflection being effected by the combined aid of the microscope and camera obscura and camera lucida or other reflectors that may be employed in place of the latter.* Dated Apr. 15, 1856. (No. 896.)

This invention consists in the conjoint application of the camera obscura and camera lucida to the microscope, for obtaining photographic pictures of microscopic objects.

DEMAIN, J. *An improvement in connecting railway carriages.* Dated Apr. 15, 1856. (No. 901.)

The connection is effected by self-acting catches attached to each carriage. The catch-coupling consists of a rod with a tapered catch at its end, and is fixed into the railway carriage where the ordinary couplings are fixed. This catch is made to meet a similarly tapered catch on the other carriage. When the catches meet, the rods give way, so as to allow the catches to pass over each other until they reach the end of the taper. The rod of the coupling is then pressed back to its position by a spring acting upon it, so that the catch to each enters a socket at the back of the corresponding catch on the other rod. The invention includes a mode of releasing the catches when required, by the action of levers operating against the face of the tapered catch.

NORMINTON, E. N. *The manufacturing of railway grease for the cleansing and re-manufacturing of old used dirty railway grease or greases, for the cleansing and re-manufacturing of old dirty cotton waste, tow, or any textile fabric.* Dated Apr. 16, 1856. (No. 904.)

1. The inventor combines a mixture of carbonate and sulphate of soda with water. 2. He takes old dirty used railway grease, and separates the oily or fatty matter from the dirt and metallic oxides by the application of heat and strong soap leys, and the residue he converts into soap, which soap he reconverts with the oily or fatty matter separated as above, or with palm oil, or any other fatty matter for the manufacture of railway grease. 3. He takes weak soap leys and boils in them dirty cotton waste: the leys convert the oily matter in the cotton waste into soap, and thereby cleanses the cotton waste.

MELLODEW, T., and J. DUXBURY. *Improvements in shuttles for weaving.* Dated Apr. 16, 1856. (No. 907.)

The object here is to effect a delivery of the yarn from the shuttle with greater equality of friction, to accomplish which the inventors cause the cop as it becomes reduced to advance along the peg. One arrangement they employ, and which will illustrate the invention, consists in the application of a spiral spring placed around the peg, and compressed by the adaptation of the cop; as the yarn becomes unwound the resistance is lessened, and the remaining part of the cop is forced forward.

WILKINSON, W. *Improvements in steam engines.* Dated Apr. 16, 1856. (No. 913.)

Two pistons are used in the steam cylinder, which are at a distance from each other, but connected together. The main shaft passes into the steam cylinder, and has a crank fixed or formed thereon. A connecting rod is at one end attached to the crank pin of the crank, and at the other end by a pin joint near the end of a hollow trunk formed to one of the pistons. One of the end covers of the steam cylinder is constructed with a hollow trunk suitable for receiving within it the trunk formed to the piston.

HULME, C., S. IVERS, and J. YARDLEY. *Improvements in power looms for weaving.* Dated Apr. 17, 1856. (No. 914.)

This invention applies—1. To a method of stopping the loom, either upon the breaking of a warp or weft thread, or on the accidental occurrence of imperfect weaving, and consists in the employment of a light metal bar, &c. 2. To a novel method of actuating the picker arms of power looms, particularly those which have the fulcrum of the arm placed below the shuttle box.

EYRE, S. *An improved application of portable mirror.* Dated Apr. 17, 1856. (No. 918.)

The inventor mounts a swing mirror in a frame which, by preference, he supports on a rod that slides in a telescope tube, and this tube is affixed by suitable brackets to a chair back, couch, or settee, which, when the mirror is to be used, must be placed opposite the toilet glass.

LUNTLEY, J. *A new fabric or fabrics suitable for wearing apparel and other purposes to which textile fabrics are applicable.* Dated Apr. 17, 1856. (No. 919.)

This invention consists in the manufacture of fabrics from the fibres of the sunflower plant, and others of the helianthus tribe, either alone or combined with silk, cotton, linen, and woollen fabrics.

BUDDEN, W. *An improved method of preparing cheques, invoices, and other papers so that they may be readily separated from their counterparts.* Dated Apr. 18, 1856. (No. 925.)

This invention consists in introducing a piece of notched or cut metal in the cheque, or other printed form, where one part of a document is to be separated from another, and overlaying it with paper or cardboard, so that, while being printed, the metal cuts through the paper at intervals sufficient to render the paper easily torn.

PROVISIONAL PROTECTIONS.

Dated August 30, 1856.

2018. François Long, of Paris. Improvements in life-boats.

Dated September 19, 1856.

2195. William John Bisseker, of Ludgate-hill, Birmingham, manufacturer. Improvements in strings or wires used in or on musical instruments.

Dated September 24, 1856.

2238. Joseph Bennett Howell, of Sheffield, steel manufacturer, and Nicholas Harvey, of Haymarket, engineer. Improvements in steam and other boilers.

Dated October 27, 1856.

2520. James Fenton, of Low Moor, near Bradford, York, engineer. An improved method of and signal apparatus for preventing accidents on railways.

Dated November 8, 1856.

2630. William Gossage, of Widnes, Lancaster, chemist. Improvements in the manufacture of carbonates of zinc, of iron, and of manganese, and in the useful application of such carbonates.

Dated November 21, 1856.

2754. Auguste Mathieu Maurice de Bergevin, of Sermon-lane, London, chemist. A method or methods of purifying coal without decarbonisation.

2758. Charles Tooth, of Burton-upon-Trent, brewer. Improvements in charging or filling and filling up casks or other vessels for containing fermenting liquids.

2760. Sigmund Rothenheim, of London, umbrella and walking-stick manufacturer. An improved walking-stick pipe.

2764. Samuel Russell, of Gravesend. Improvements in the construction of scissors and shears.

2766. Charles Garton, of Bristol, brewer, and James St. John Gage Parsons, of the same city, member of the Royal College of Surgeons. A method of treating cane sugar in order to fit it to be employed in brewing and distilling.

Dated November 22, 1856.

2770. George Bell Galloway, of Basinghall-street, engineer and shipowner. Improvements in furnaces for steam boilers and other uses.

2774. Joseph Wheeler, of Wootton-under-Edge, Gloucester, gentleman. A method of converting rotary into reciprocating motion, especially applicable to machinery for forcing plastic substances through moulds and dies.

2776. John Skirrow Wright, of Birmingham, manufacturer. Improvements in the manufacture of paper or papier mâché and metal buttons.

2778. David Chadwick, of Salford, Lancaster, gentleman, and Herbert Frost, of Manchester, machinist. Improvements in apparatus for measuring water and other fluids and gas.

Dated November 24, 1856.

2780. Edmund Hunt, of Glasgow, mechanical engineer. Improvements in looms for weaving ornamental fabrics.

2782. James Broadley, of Saltaire, York, overlooker. Improvements in weaving.

2784. Masta Joscelin Cooke, of Deane-street, Newcastle-on-Tyne, commission agent. Certain improvements in washing, wringing, and mangling machines.

2786. William Henry Aston and Samuel Hopkinson, of Huddersfield. Improvements in steam boiler furnaces, and apparatus employed for supplying water to steam boilers.

2788. Charles Edward Heinke, of Great Portland-street, submarine engineer. Improved apparatus for illuminating objects beneath the surface of water, or for giving light in mines and other places where combustible or explosive gases exist.

2790. George Sharp, of Jarrow, Durham, millwright, and William Elder, of the same place, engine smith. Improvements in steam hammers and machinery for forging iron and other substances.

Dated November 25, 1856.

2792. Henry Bragg, jun., of Belfast, commission agent. Improvements in drying or extracting moisture from air, and in machinery or apparatus for starching, clearing, drying, stretching, and finishing fabrics.

2794. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in machinery for embroidering. A communication from E. Lebée.

2796. Jacob Levi Elkin, of Jeffreys-square, St. Mary-axe, merchant. An improved process ap-

plicable to the manufacture of zinc. A communication.

2798. Alfred Vincent Newton, of Chancery-lane, mechanical draughtsman. Improved machinery for forging iron. A communication.

Dated November 26, 1856.

2800. John Brown, of Bolton-le-Moors, Lancaster, machine maker, and John Adin, of Manchester, manufacturer. Certain improvements in Jacquard machines.

2801. Léon Germain Riant, of Rue de l'Echiquier, Paris, gentleman. An improved mode of preparing whalebone, gutta percha, and other elastic bands employed in the manufacture of wearing apparel.

2803. Matthew Henderson, of Glasgow, mason. Improvements in cutting, sawing, or shaping and polishing stone.

2805. Alfred Vincent Newton, of Chancery-lane, mechanical draughtsman. An improvement in the process of coating iron bolts, bars, sheets, spikes, nails, and other articles of iron, with metallic alloys, for the prevention of rusting or oxydation. A communication.

2806. Henry Eastman Palmer, of Stonehouse, Devon, artist. Improvements in photographic apparatus.

Dated November 27, 1856.

2807. Asa Lees, of Oldham, Lancaster, machine maker, and David Schofield, of the same place, manager. Certain improvements in self-acting mules for spinning and doubling.

2808. Peter Armand Lecomte de Fontainemoreau, of Rue de l'Echiquier, Paris. Improved weighing apparatus. A communication.

2809. William Armand Gilbee, of South-street, Finsbury. An improved mode of reefing and reducing top sails. A communication.

2810. William Woofe, of Weston Birt, Gloucester, agriculturalist. An implement for paring land, applicable also to the removing of turf.

2811. Paul Rapsey Hodge, of Albion-grove, Barnsbury-park, Islington, civil engineer. Improvements in the manufacture of felted cloth.

2812. Henry Hedgely, of New-road, Brighton. Certain improvements in spirit lamps.

Dated November 28, 1856.

2815. James Higgin, of Manchester, manufacturing chemist. Improvements in treating certain vegetable dye-stuffs, or preparations therefrom, so as to obtain a coloring substance of increased purity.

2817. Auguste Cellier, of Rue de l'Echiquier, Paris. An improved mucilage, applicable to the sizing and printing of textile materials.

2819. Henry Turner Sourbuts, of Hyde, Chester, mechanic. Improvements in taps or valves, part of which are applicable to lubricators for steam engines and other purposes.

2821. Archibald Turner, of Leicester, elastic web manufacturer. Improvements in the manufacture of elastic fabrics.

Dated November 29, 1856.

2823. John George Taylor, of Glasgow, merchant. Improvements in pencil cases.

2825. James Dryden, of Dundee, N. B., manager. Improvements in weaving.

2829. John Brown, of Liverpool, mast maker. Improvements in the construction of the lower masts of ships.

2831. Joseph Latimer Clark, of Adelaide-road, Haverstock-hill, Hampstead. Improvements in electric telegraphs. Partly a communication.

Dated December 1, 1856.

2833. Joseph Worthington, of Manchester. Improvements in telegraphing and communicating on railway trains.

2835. John Christian Jones, of Poland-street, Oxford-street, upholsterer. The improvement of the common pin wooden leg and crutch.

2837. John Gedge, of Wellington-street South, Strand. Improvements in gas meters. A communication.

2839. John Gibson, of Paddington, engineer. Improvements in buffing and drawing apparatus.

2841. Edward Jackson Emmons, of Massachusetts, U. S. A new or improved nursery chair. A communication.

2843. Francis Peabody, of St. James-street, Westminster. Improved apparatus for obtaining motive power by the action of the wind.

2845. Henri Nicolas Denis Bardot, of Paris, chemist. Improvements in treating or preparing colours for printing.

Dated December 2, 1856.

2847. Edmund Dwyer, of Woolwich, accountant. Improvements in the manufacture of children's chairs.

2849. John Longbottom, of Leeds, engineer. Improvements in apparatus for drying, roasting, carbonizing, and calcining vegetable, mineral, and animal substances.

2851. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in bleaching. A communication from H. Bouchet.

2853. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in pumping engines and in pumps. A communication.

2855. John Fowler, jun., of Havering, Essex. An improvement in the manufacture of wire ropes.

2857. Robert Dryden, of Kinaston-street, Lambeth, and Stephen Miles, of South-terrace, Willow-walk, Bermondsey, engineers. An improvement in the construction of cylinder printing presses.

2859. Alfred Bower, of Liverpool, cotton broker. Improvements in or applicable to the keels of navigable vessels.

2861. Frederic Siemens, of John-street, Adelphi, engineer. Improved arrangement of furnaces, which improvements are applicable in all cases where great heat is required.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

2878. Ebenezer Daggett Draper and George Draper, of Massachusetts, U. S. A. New and useful improvements in oil feeders, vessels, or cans for oiling machinery. Partly a communication. Dated December 4, 1856.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," December* 16*th*, 1856.)

1819. J. W. Brett. Improvements in letter and numeral printing electric telegraphe.

1839. J. Firth and J. Crabtree. Weaving Scotch, Kidderminster, and Dutch carpets by means of a power loom.

1844. A. D. Sisco. Improvements in railway brakes.

1846. J. J. Danduran. An apparatus called the self-swimmer.

1848. J. Keith. Improved machinery for making envelopes. A communication.

1849. A. V. Newton. An improvement in primers for fire-arm cartridges. A communication.

1867. J. Leese, jun. Certain improvements in machinery used for printing calico and other fabrics.
1869. T. Austen. A machine for ascertaining the propelling force of gunpowder.
1870. W. Gorse. A new or improved door-fastener. A communication.
1876. T. Whittaker. Improvements in the mode or method of washing or cleansing woven fabrics.
1881. A. L. Reid. Improvements in producing ornamental figures or devices on textile fabrics and other surfaces.
1883. G. Anderson. Improvements in the construction of taps or valves for regulating the passage of gas.
1884. P. A. L. de Fontainemoreau. A new electro-motive engine. A communication.
1894. D. Lesser. Certain improvements in machinery or apparatus for making lozenges or other similar articles.
1896. W. Church and H. W. Hamlyn. An improved method or improved methods of constructing or building hay and other ricks.
1907. J. B. Smith. Certain improvements in machinery for preparing, spinning, and twisting cotton, and other fibrous substances.
1921 L. A. Joyeux. Improvements in obtaining motive power.
1934. P. Noyer. Winding up fusee watches and pocket chronometers, and setting the hands without key.
1937. R. Jobson. Improvements in apparatus for pouring iron or other metal into moulds.
1939. J. Brouard and J. Hubert. Certain improvements in reefing the sails of ships or vessels.
2094. T. Restell. Improvements in breech-loading fire-arms and ordnance.
2198. P. Lafitte. An improved engine with rotary piston, applicable to various purposes.
2370. J. Shaw and E. Shaw. Certain improvements in pianofortes, organs, harmoniums, and other similar keyed musical instruments.
2417. R. F. Sturges. A new or improved manufacture of rollers or cylinders for printing fabrics.
2452. R. A. Brooman. Improvements in farthingales or petticoats. A communication.
2482. G. C. Potts. The application of certain materials to the cleaning of casks.
2520. J. Fenton. An improved method of and signal apparatus for preventing accidents on railways.
2563. E. J. Hughes. An improved mode or method of concentrating the colouring matter of certain vegetable substances.
2609. G. Collier. Improvements in drying, stretching, and polishing or finishing yarns.
2630. W. Gossage. Improvements in the manufacture of carbonates of zinc, of iron, and of manganese, and in the useful application of such carbonates.
2707. G. Pye. An improvement in treating and bleaching cotton.
2727. W. Brindley. Improvements in the treatment and application of papier-mâché for covering floors, roofs, and other like useful purposes.
2731. J. Jones and E. Jones. Improvements in the manufacture or production and treatment of metal castings.
2758. C. Tooth. Improvements in charging or filling and filling up casks or other vessels for containing fermenting liquids.
2774. J. Wheeler. A method of converting rotary into reciprocating motion, especially applicable to machinery for forcing plastic substances through moulds and dies.
2777. W. E. Laycock. Improvements in looms for weaving.
2782. J. Broadley. Improvements in weaving.
2788. C. E. Heinke. Improved apparatus for illuminating objects beneath the surface of water, or for giving light in mines and other places where combustible or explosive gases exist.
2796. J. L. Elkin. An improved process applicable to the manufacture of zinc. A communication.
2797. J. Marshall, jun. An improvement in the purifying of oils and fatty matters.
2815. J. Higgin. Improvements in treating certain vegetable dyestuffs, or preparations therefrom, so as to obtain a colouring substance of increased purity.
2825. J. Dryden. Improvements in weaving.
2851. R. A. Brooman. Improvements in bleaching. A communication.
2853. R. A. Brooman. Improvements in pumping engines and in pumps. A communication.
2861. F. Siemens. Improved arrangement of furnaces, which improvements are applicable in all cases where great heat is required.
2878. E. D. Draper and G. Draper. Certain new and useful improvements in oil-feeders, vessels, or cans for oiling machinery. Partly a communication.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1853.
2859. Pierre Marie Fouque, Louis Réné Hébert and Vincent Etienne Doret Le Marneur.
2890. James Wansbrough.
2892. Christian Schiele.
2897. John Ambrose Coffey.
2899. John Zuill Kay.
2912. Jean Baptiste Pascal.
2913. Frederick William Branston.
2921. William Tranter.
2933. Charles Goodyear.
2942. John Greenwood.
2956. Josiah Latimer Clark.
2997. Frederick Crace Calvert.
1854.
83. Auguste Edouard Loradoux Bellford.

LIST OF SEALED PATENTS.

Sealed December 12, 1856.

1392. Philip Unwin and John Unwin.
1394. James Fairclough.
1414. William Seed.
1415. Edward Lindner.
1420. James Ball Mannix.
1434. Raymond Leopold De Berenger.
1435. Thomas Burton.
1449. Jacinto Dias Damasio.
1501. Gustave Durrich.
1531. Ebenezer Rogers and Herbert Mackworth.
1542. John Lacey Davies, jun., and John Broadbent.
1553. William Frederick Spittle.
1775. Isham Baggs.
1932. James Leach, William Turner, and John Tempest.
2294. John Holman.

Sealed December 16, 1856.

1430. Frederick Collier Bakewell.
1442. William Hunt.
1448. William Parsons.
1452. John Talbot Pitman.
1455. Jonathan Hague.

1468. Goldsworthy Gurney.
1502. John Gratrix and Alfred Knight.
1510. Basilio Scariano and Raphael Paul de Villamil.
1514. Charles Augustus Preller.
1518. George Henry Ormerod.
1526. Charles Armand Massager-Ablt.
1536. Charles Wolde Goodhart.
1554. Edwin Green.
1562. Alfred Vincent Newton.
1729. Clothide Amet.
1936. Henry Burden.
2096. Alfred Vincent Newton.
2217. Thomas Evans Blackwell.
2243. Thomas Holmes and Thomas Aspinall.
2252. Matthew Andrew Muir and William James Walker.
2360. Henry Watson and John Dixon.
2424. Jane Elizabeth Reed.
2430. John McDowall.
2434. Alfred Vincent Newton.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

Veritas.—Will you be good enough to favour us with your name in confidence?

The following letters have been received:—*J. F.*, on Hearder's Induction Coil; *W. Sleevenson*, on Comets; Count *Oscar Reichenbach*, on Aerial Navigation; *Dr. J. Lotsky, A Dubious Reader*, and *W. Carroll*, on Flying by Man; *S. A. Good*, on Dr. Lardner's Investigation of the Moon's Motion; and *G. H. P.*, Marseilles, on the Moon's Motion. Those on Flying by Man and the Moon's Motion will not be inserted.

R. W. Letty, Grantham.—Mr. Laudy (whose address we have not) purchased a number of electric clocks at Mr. Bain's sale, and still has some of them, we believe, on sale. The cost of battery power for working such clocks is trifling. A friend of ours has had one worked by the contents of a pickle bottle since June last, and, to all appearance, it will last a couple of years longer.

H. Erwin, Eccles.—The validity of a British Patent would be affected by prior publication in this country; but not by previous publication, or by actual operation in any foreign state.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

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LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1742.] SATURDAY, DECEMBER 27, 1856. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

WILLIAMS'S APPARATUS FOR THE CULTIVATION OF LAND.

Fig. 1.

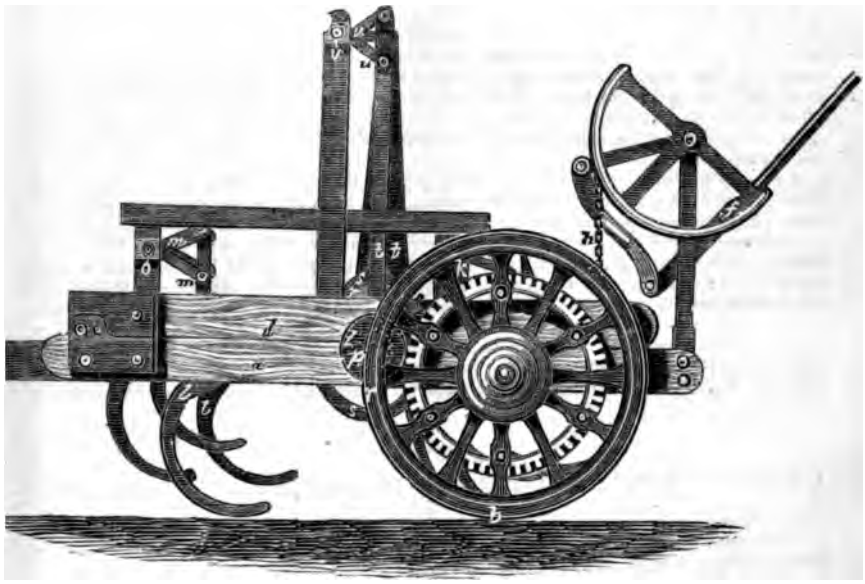
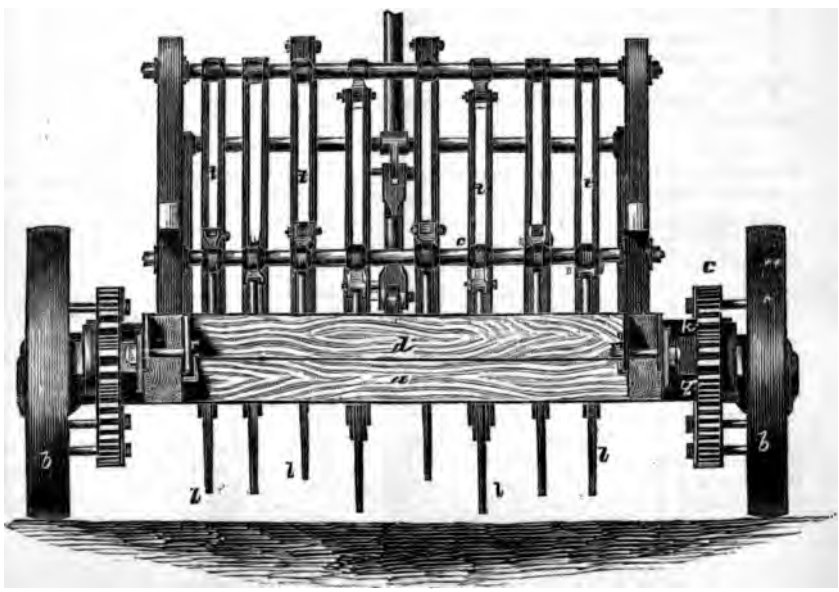


Fig. 2.



WILLIAMS'S APPARATUS FOR THE CULTIVATION OF LAND.

Mr. C. R. Williams, farmer, of Shiffnal, Salop, has patented an implement or apparatus for the cultivation of land, which we have illustrated by the engravings on the preceding page. Fig. 1 is a side, and fig. 2 an end elevation. *a* is the carriage on which the implement is supported; *b*, are the wheels on which the carriage, *a*, is drawn. Motion is communicated to the implement by means of the toothed wheel, *c*, on the axis of the wheel, *b*. *d* is a frame jointed at *e* to the carriage, *a*. The frame, *d*, may be raised and lowered by means of the semicircle, *f*, and lever, *g*. By depressing the lever, *g*, the chain, *h*, is wound upon the semicircle, *f*, and the frame, *d*, raised. The pinion, *k*, is disengaged from the toothed wheel, *c*, by the lifting of the frame, *d*, and the implement or apparatus is no longer put in motion by the travelling carriage, *a*. *l l* are a series of prongs or blades of the form represented; the prongs or blades, *l l*, are jointed to levers, *m m*, at *n*, and the said levers, *m m*, are jointed to the fixed bar, *o*. *p* is an axis, to which motion is communicated from the wheel, *c*, through the pinions, *k* and *q*. A series of excentrics, *r*, are fixed upon the axis, *p*, the said excentrics being adjusted upon the said axis, *p*, in a manner which will be understood by reference to the engraving. *s* are clips upon the excentrics, *r*, vertical rods, *t*, on the said clips, *s*, being jointed to rods, *u*, and the rods, *u*, being jointed to the fixed bar, *v*; horizontal arms, *w w*, on the clips, *s*, are jointed to the prongs or blades, *l*, at *x*. As the carriage, *a*, is drawn along, motion is communicated to the axis, *p*, and from the said axis, *p*, through the excentrics, *r*, clips, *s*, and arms, *w*, to the prongs or blades, *l*. The lower pointed and curved ends of the prongs descend successively into the ground, each of the said prongs or blades having an advancing as well as a descending motion; after having attained the maximum depth, the prongs or blades commence an ascending motion, and then again enter the ground at or near the place where they left it. The motion described is performed by each of the prongs or blades, and the arrangement of the excentrics, *r*, upon the shaft, *p*, is such that the prongs follow each other in their motion, so as to present a nearly uniform resistance to the rotation of the axis, *p*. Although the inventor prefers to make each of the excentrics, *r*, to move two of the prongs or blades, *l*, yet a single prong, or more than two prongs, may be actuated by each of the excentrics, *r*.

A GENERAL DEMONSTRATION OF THE "PYTHAGOREAN THEOREM.

The following demonstration of the above well-known theorem is adapted to the six possible cases which result from varying the positions of the three squares in relation to the sides of the triangle and to each other; viz.,

1. The three squares on the three exterior sides of the triangle.
2. The three squares on the three interior sides of the triangle.
3. The two smaller squares on the exterior sides, and the greater on the interior side.
4. The two smaller squares on the interior sides, and the greater on the exterior side.
5. The greater and one of the smaller squares on the exterior sides, and the other on nterior side.
6. The greater and one of the smaller squares on the interior sides, and the other on the exterior side.

EUCLID, 47th PROPOSITION, BOOK 1st.

In any right angled triangle, the square described upon the side subtending the right angle, is equal to the sum of the squares described upon the two sides which contain the right angle.

Let ABC (figs. 1, 2, 3, 4, 5 and 6) be a right angled triangle, having the right angle BAC. The square described upon the side BC shall be equal to the sum of the squares described upon the two sides AB and AC.

Upon the side { BC describe the square CBDE. / AB describe the square AGNB. / AC describe the square ACKH. } (*by Euclid i.* 46.)

Through A draw AL parallel to BD or CE. (*Euc. i.* 34.)

Produce (if necessary) CE or HK, or both, to meet in F, which they will do, because the angles CKF and KCF together are less than two right angles. (*Euc. i. ax.* 12.)

Join AF.

The angle BCF is equal to the angle ACK, each of them being a right angle (by const.); from each of these equals take the common angle ACF or BCK; and the remaining angle KCF is equal to the remaining angle ACB. (*Euc. i. ax.* 3.)

But the angle CKF is equal to the angle CAB, each being a right angle (by const. and hypot.) and AC is equal to CK, being sides of the same square ACKH; therefore the

Fig. 1.

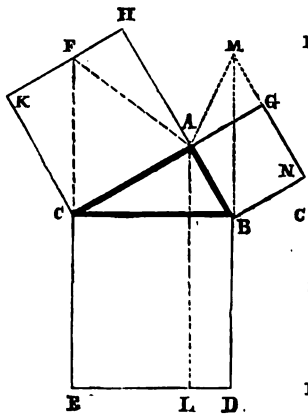


Fig. 2.

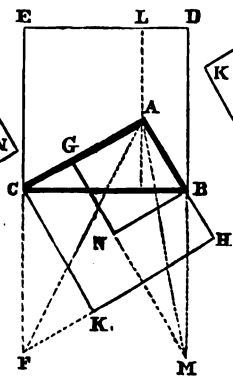


Fig. 3.

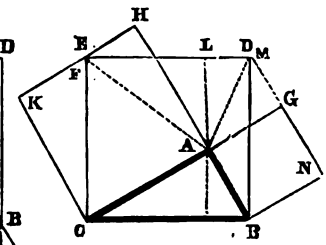


Fig. 4.

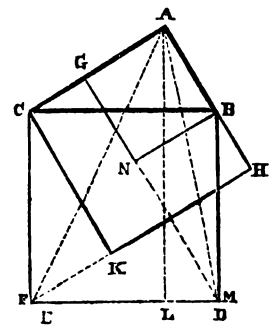


Fig. 5.

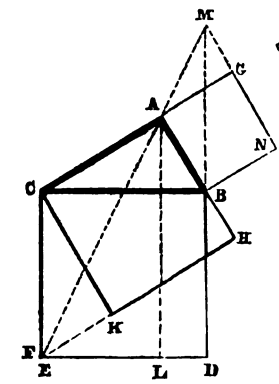
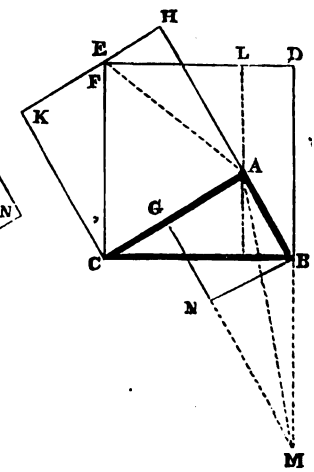


Fig. 6.



triangle CKF is equal to the triangle ABC, and the side CF equal to the side BC (*Euc. i.* 26). But BC is equal to CE (*Euc. i. def.* 30.) Therefore CF is equal to or coincides with CE. (*Euc. i.* 26.)

Now the parallelogram CL is double of the triangle AFC (*Euc. i.* 41), because they are upon the same or equal bases CF and CE, and between the same parallels CF and AL.

Also the square ACKH is double of the triangle AFC (*Euc. i.* 41), because they are upon the same base AC, and between the same parallels AC and HK. But the doubles of equals are equal to one another (*Euc. i. ax.* 6).

Therefore the parallelogram CL is equal to the square ACKH.

Similarly, by producing GN, or DB and GN, to meet in M, and joining AM, it can be proved that the parallelogram BL is equal to the square AGNB.

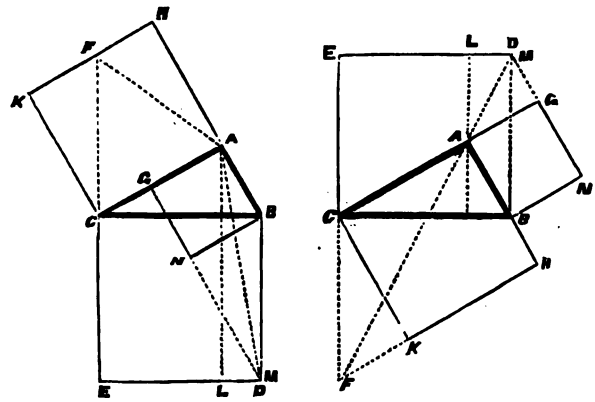
Therefore the whole square CBDE, which is made up of the two parallelograms CL and BL, is equal to the sum of the two squares ACKH and AGNB (*Euc. i. ax.* 2.) And the square CBDE is described upon the line BC, and the squares AGNB and ACKH upon the

straight lines AB and AC. Therefore the square upon the side BC is equal to the sum of the two squares upon the sides AB and AC.

Wherefore in any right-angled triangle, &c. Q.E.D.

It is evident that when the triangle is not isosceles as well as right-angled, the fifth and sixth of the above cases may be varied as in figures 5* and 6* by changing the positions of

Fig. 5*. Fig. 6*.



the smaller squares; so that actually there are eight cases, although the *terms* of the six cases above enumerated include the whole.

It is easy to construct one figure which embraces the whole of the cases, but the employment of a separate figure for each case facilitates the perusal of the demonstration.

HENRY JULIAN WARIN.

38, Arthur-street, Gravesend.

INSTITUTION OF CIVIL ENGINEERS.

December 16, 1856.

ANNUAL GENERAL MEETING.

G. P. BIDDER, ESQ., VICE-PRESIDENT, IN THE CHAIR.

THE report of the council for the past session, which was read, stated that since the corresponding period of the last year, though political tranquillity had been restored, the monetary crisis consequent upon the large public expenditure occasioned by a state of warfare had retarded the resumption of works of public and private enterprise.

Some few of the foreign works in progress were then noticed, mentioning particularly the successful opening and the extension of the East Indian railway under Mr. Rendel, the late distinguished past-president of the Institution. In connection with this subject it was stated, that the honour of knighthood had been conferred upon Mr. Macdonald Stephenson, Assoc. Inst. C. E., who originally proposed, and had carried out the first portions of the vast network of railways which was destined to work such a revolution in the Indian empire. A similar distinction was, at the same time, conferred upon Dr. O'Shaughnessy, the energetic projector and constructor of a system of electric telegraphs extending over nearly 4,000 miles through dense jungle, or over the vast plains, rivers, and mountains of India. The Indian Peninsular Railway, constructing by Mr. James Berkley, M. Inst. C. E., under the direction of Mr. R. Stephenson, M.P., president, had now about 100 miles opened, and the great work of extension up to Sholapoor, and through the Bhore Ghaut, was now fast progressing, whilst the execution of the north-eastern extension across the Thull Ghaut towards Nagpore and Jubbulpore, and the Berar cotton-fields, would soon be commenced. The Madras, the Bombay and Baroda, and the Scinde railways were being vigorously prosecuted: and several other lines were projected, among which was that from Seleucia, on the Mediterranean, to Jabr Castle, on the Euphrates, which river it was proposed to navigate by means of steam vessels of shallow draught of water. This recent project had been entrusted to Sir John Macneill, M. Inst. C. E. Since the kingdom of Oude had become a part of the British possessions, arrangements had

been made for affording it the benefit of participation in the railway system, which would be commenced by the construction of a line of 50 miles in length between Cawnpore and Lucknow, whence branches would extend to the most important districts, and be connected with the East Indian railway. Other lines were also proposed for Gorruckpore, Tirhoot, and Purneah, all contributing to the completion of the internal communications of India.

The Pernambuco railway, in the prosecution of which the late Mr. M. A. Borthwick, M. Inst. C. E., lost his life, had been placed in the charge of Mr. W. M. Peniston, M. Inst. C. E., and was making satisfactory progress.

The Dom Pedro the Second railway, starting from Rio de Janeiro, and passing up the "Serra" into the valley of the Parahiba, and through the principal coffee-producing districts, would be about 200 miles in length. The first section of 40 miles was commenced in 1855, and would be completed by about the middle of next year. The survey was made amidst a dense primeval forest, and in many places through water 5 feet or 6 feet deep, and great difficulty was encountered in executing the earthworks with slave labour and inadequate tools. By degrees, however, European methods were introduced by Mr. E. Price, Assoc. Inst. C. E., the contractor; and under the superintendence of Mr. C. B. Lane, M. Inst. C. E., the engineer-in-chief to the home department of the Brazilian Government, the railway promised to become a fine enterprise. Mr. Charles Neate, Assoc. Inst. C. E., was also engaged under the Brazilian Government in constructing important hydraulic works at Rio de Janeiro. They consisted of quay walls along the sea front of the city, with piers and jetties formed of granite masonry, set in lias mortar, for which the limestone was sent from England.

In Canada, the railway undertaken by Messrs. Peto, Brassey, Betts, and Jackson, might be said to be complete, with the exception of the link to be formed by the Victoria tubular bridge across the river St. Lawrence, which was now in progress.

On the Continent, gradual extensions of all the main lines were being made. The Lombardo-Venetian system had been transferred to a powerful company, now preparing to act with great energy in the prosecution of their plans. The "Victor-Emmanuel" line, under the direction of Mr. Bartlett, M. Inst. C. E., acting for Mr. Brassey, Assoc. Inst., C. E., the contractor, was approaching the chain of the Alps, for the traversing of which preparations were being made, and experiments upon the machinery for the work of tunnelling on a large scale were being tried. That portion of the line from Aix-les-Bains, passing through Chambery to St. Jean de Maurienne, upwards of 55 miles in length, was opened for public traffic last October. The works were originally laid out by, and to a great extent executed, under the direction of Mr. Nieumann, who was succeeded last year by Mr. Ricceo, under whose supervision they were now carried on.

In Turkey and in Russia extensive projects both for railways and steam navigation were being agitated; while in Egypt H. H., the energetic Said Pacha, was completing the railway communication between Cairo and Suez, spanning the Nile by a vast iron bridge at Kaffre Azzayat, and had confided to Mougel Bey the construction of the preliminary works for the canal across the Isthmus of Suez, advocated by M. Ferdinand de Lesseps; whilst he had authorised the establishment, upon the Nile and the Mahmoudieh canal, of a complete system of steam towing vessels and barges, now in course of construction in this country.

One of the most important, as well as most interesting projects of the period was the submarine electric telegraph cable proposed to be laid from Valentia, on the west coast of Ireland, to St. John's, Newfoundland, a distance of 1,600 miles along the bank or plateau discovered by Lieutenant Maury, over which the greatest depth of the ocean did not exceed 2,070 fathoms. By a new method of enclosing the insulated conducting wires within a covering of ropes, composed of small wires laid in an opposite direction to that of the general "lay" of the cable, a light and flexible cable was formed, which was stated to be capable of bearing the strain of depositing in extreme depths, and having no tendency to twist or "kink" during the process. This ingenious modification of the usual construction of cable, was devised by Mr. Brunel, V. P., whose co-operation was sought by Mr. Cyrus Field and Mr. J. W. Brett, the projectors, under the advice of Professor Morse. The successful result of this daring project for connecting the old with the new world would be more effectual than any efforts of diplomacy in cementing that intimate union, so desirable for the true interests of the two countries.

The vital questions of the metropolitan sewerage, the new streets, and the bridges, remained as undecided as at the period of the last report.

The principal papers read during the session were then noticed, mention being particularly made of the oral addresses by Mr. Bidder, V. P. Inst. C. E., "On Mental Calculation," the object of which was to

demonstrate that the system could be taught to children, and be acquired with less irksomeness and greater facility than ordinary arithmetic. Special notice was also taken of the paper by Mr. John Murray, M. Inst. C. E., on the "Sunderland Docks," which, as an example of dock engineering, stood almost unrivalled in this country.

The members were strongly urged to continue to present copies of scientific and professional works to the library, without which its utility for reference and consultation could not be maintained.

The deceases of the members during the year were announced to have been:—the Rev. Dr. Buckland, honorary member; Messrs. M. A. Borthwick, J. Bremner, J. Chisholm, S. Clegg, jun., C. Rammell, J. M. Rendel, T. H. Statham, F. Whishaw, and T. J. Woodhouse, members; and Lieut.-Gen. D. M'Leod, Messrs. J. Beatty, T. Cubitt, D. M'Intosh, J. F. Miller, and R. Wilkins, associates. The memoirs of these gentlemen were given in the Appendix to the Report. The resignations of one member and two associates were announced, and it was stated that the effective increase (after deducting the deceases and resignations,) during the year amounted to 14, whilst the total number on the books was 802 members of all classes.

The statement of the receipts and expenditure showed that there was a balance of upwards of 700*l.* in the hands of the Treasurer; and that the financial position was very satisfactory, so that not only would the current expenses be easily met, but a balance would remain to bring up any arrears of publication, or to provide for contingencies.

During the year the second parts of volumes 11, 12, and 14, of the Minutes of Proceedings, had been published and issued, and the whole of volume 15. There now only remained, to complete the series of fifteen volumes, extending over twenty years, the second parts of volumes 7, 8, and 10, and the whole of volume 13.

It was mentioned, that at the last Annual Meeting, Mr. Charles Manby (M. Inst. C. E.), who had held the post of Secretary for upwards of seventeen years, tendered his resignation; he had continued, however, to hold the position until the present time, but in the month of June, 1856, Mr. James Forrest (Assoc. Inst. C. E.), who was well known to the majority of the members, from his almost constant connection with the Institution during the last fourteen years, having, in fact, been partly brought up within its walls, entered on the post of Assistant Secretary, with the salary formerly devoted to Mr. Manby, who had expressed his willingness to continue to act as Secretary, gratuitously, as long as his services were considered useful to the Institution.

After the reading of the Report, Telford Medals were presented to Messrs. J. Murray, J. M. Heppel, H. Robinson, C. R. Drysdale, and F. M. Kelley; and Council Premiums of Books to Messrs. J. Murray, G. Herbert, Evan Hopkins, J. W. Heinke, J. Baillie, and W. K. Hall.

The thanks of the Institution were unanimously voted to the President, for his attention to the duties of his office; to the Vice-Presidents and other Members and Associates of Council, for their co-operation with the President, and constant attendance at the meetings; as also to the Auditors of the Accounts and the Scrutineers of the ballot, for their services. Special votes of thanks were accorded to Mr. Bidder, for his addresses on "Mental Calculation," and to Mr. C. Manby, Secretary, for the manner in which he had performed the duties of his office, and his constant attention to the individual wishes of the Members.

The following gentlemen were elected to fill the several offices on the Council for the ensuing year;—Robert Stephenson, M.P., President; G. P. Bidder, I. K. Brunel, J. Hawkshaw, and J. Locke, M.P., Vice Presidents; W. G. Armstrong, J. Cubitt, J. E. Errington, J. Fowler, C. H. Gregory, T. Hawksley, J. R. M'Clean, J. S. Russell, J. Whitworth, and N. Wood, Members; and R. W. Kennard and Sir Macdonald Stephenson, Associates.

The Meeting was then adjourned until Tuesday, January 13th, 1857, when it was announced, that the Monthly Ballot for Members would take place, and the following Paper would be read, "On Submarine Electric Telegraphs," by Mr. F. R. Window, Assoc. Inst. C. E.

ROYAL SCOTTISH SOCIETY OF ARTS.

The Royal Scottish Society of Arts met in their Hall, 51, George-street, on Monday, December 8, 1856. Professor George Wilson, M.D., President, in the chair.

The President addressed the Society on taking the chair, and the following communications were then made:

1. *On several proposed Improvements in Small Siphons; with remarks on the advantageous employment of Large Siphons for purposes for which they are not commonly used. By James Elliot, Esq., late V.P.* The various forms of the siphon were exhibited in operation. The object of the proposed improvements is to facilite the filling of the siphon in all cases, but especially in those in which it is employed for drawing off acids or other liquids with which manual contact

is undesirable. This object is effected in various ways, more or less simple, according to the circumstances of the case, but in every instance by means of an additional tube attached either to the curved part of the siphon, or near an extremity. In three of the proposed forms of the instrument, the outer end of the additional tube opens into a hollow elastic ball, with which it has an air-tight connection. In using these, the ball is first compressed with the hand; then the siphon is immersed with one or both extremities in the liquid, and the ball relaxed. The siphon immediately fills. If both ends are immersed, the siphon is lifted out full; but if one end only is immersed, the finger is placed upon the other, and after relaxing the ball the finger is withdrawn, without any contact with the liquid, and the liquid instantly flows. The employment of large siphons was recommended in certain cases of draining ponds and mosses temporarily, as, for instance, to obtain deposits of marl from their beds, instead of the common process of deep cuttings or tunnels, and also in such cases as exhausting the water from coffer dams in rapid streams, instead of the usual method by pumping.

A discussion followed, from which it appeared that one of the forms of siphon exhibited by Mr. Elliot had been patented, viz., that with the flexible ball.

2. *Description and Drawings of Messrs. J. and G. Hunter's Patent Improvements in Stone-cutting Machinery, with Specimens of Work and of one of the Tools. By Mr. B. K. Hunter, Manchester.* The object of the machine was stated to be to cut freestone of any sort into sizes suitable for building or other purposes, by means of hardened tools or cutters fixed in the periphery of a revolving disc, on the principle of a circular saw, and to supersede the slow and ordinary method of cutting by friction with iron plates and sand. By this new method, a common grindstone of any thickness can be cut through with very little waste of steel, and fed forward to the machine at the rate of 7 inches per minute. The tools are of round bar steel, and are made hollow up the stem (trumpet-shaped) to facilitate the sharpening of their edge, which is thinned out upon the horn of the anvil, and then driven into a mould made for the purpose, after which they are slightly ground. The thickness of cut taken with an 11 feet disc is 1¼ inches; thinner cuts may be taken with smaller sized discs. It was stated that a number of these machines are at work in different parts of Scotland; and in Dean Forest, Gloucestershire, one with a disc 11 feet diameter is used for cutting up freestone blocks into flags for paving, and is able to turn off 250 superficial feet in ten hours—the force required to drive it being about one horse-power. Two labourers are required to attend the machine, and a smith to sharpen the tools, one set of which, twenty-four in number, is able to cut 80 or 90 feet of ordinary stone, and from 40 to 50 feet of common grindstone, the total waste of steel being at the rate of six ounces per 100 feet of stone cut. The advantages of the machine were stated to be, that it requires no skilled person to work it, as any labourer can turn or replace the tools, they being completely self-adjusting; and that it can cut at least ten times more stone than any other machine with the same amount of horse-power.

3. *Description of an Apparatus for Rescuing from Drowning on the Ice giving way. By Mr. Thomas D. Bryce, 4, Calton-street, Edinburgh.* This was a model of a rescue, whereby a group of people, having fallen into the water by reason of the ice breaking, will be enabled all to save themselves from drowning, by finding steps to answer their various positions, by which to climb up to the surface all at one time without delay, as in the case of the ordinary ladder. The inventor stated that the steps are made of willow, morticed into oak sides, painted red and white, in spaces alternately, and with a narrower wing of steps at each side, supported with rope sides, to admit a safety plank to slide through between the steps at each side of the aperture in the ice, at any depth of water, and to support persons assisting the people upwards, and to hold the rescue steady, in the event of more ice giving way. The rescue is four feet longer than the depth of the water where it is to be used. The appended portable rope ladder, with willow steps, hooked upon the top bar, will hang perpendicularly when the rescue is let down at an angle, stretching some feet distant from it at the bottom of the water, thus affording six ways of escape at the same time.

After discussion, the apparatus was referred to a committee.

CHADBURN'S PRESSURE GAUGE.

Mr. Alfred Chadburn, optician, of Sheffield, has patented an improved construction of pressure gauge, in which he employs a bell-crank lever, &c., to transmit the deflections caused by the pressure of steam or other fluid upon a flexible disc.

Fig. 1 is a front view of the instrument, showing the dial or index plate with the index hand in front; fig. 2 is a partial back view, showing the principal working parts, the back plate of the outer box or case

being removed; fig. 3 is a longitudinal section of the same in the line 1, 2, of fig. 1.

The working parts are placed in a metal case, *a*, *a*, which may, if required, be furnished at each side with lugs or ears,

Fig. 3.

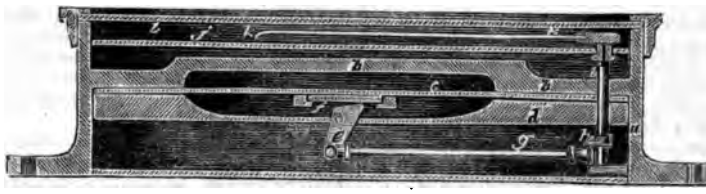
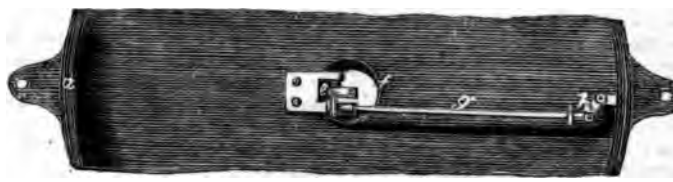


Fig. 2.



whereby it may be secured in any suitable place. The interior of the box is divided by a strong rigid partition, *b*, *b*, having a recess made at its central part, as shown in fig. 3; *c*, *c*, is a metal plate or disc, securely held against the back of the partition, *b*, by a strong plate or collar, *d*, and therefore leaves a space, A, between the partition, *b*,

Fig. 1.

and plate, *c*. Into this space the steam (or other fluid or liquid the pressure of which it is desired to ascertain) is admitted through a suitable opening from the pipe, B. By the pressure of the steam on the upper side of the plate, *c*, the latter will be caused to deflect and act upon the shorter arm of the lever, *e*, which is kept constantly in contact therewith. The under side of the plate, *c*, is provided at its central part with a small flat disc of Brazilian pebble, agate, or other hard substance, as shown at *f*, against the surface of which the short end of the lever, *e*, works. The opposite end of the lever, *e*, is connected by means of a rod, *g*, to the end of another lever, *h*, mounted at the lower end of the spindle or shaft, *i*, the upper end of which passes through the dial or index-plate, *j*, and carries the index arm, *k*. The dial and index are covered up by a strong plate of glass, *l*, to prevent injury or tampering. On steam being admitted through the pipe, B, the pressure will act on the disc, *c*, and depress the crank-lever, *e*; this lever will be thereby turned on its centre, and caused to push forward or draw back the rod, *g*, which connects it to the lever, *h*, on the spindle, *i*, of the index hand. By thus acting on the levers, *e* and *h*, the spindle of the index hand will be made to turn on its bearings, and move the hand, *k*, over the segmental scale of the dial a distance proportionate to the pressure exerted by the steam on the plate, *c*. When the gauge is used for indicating the pressure of steam, the chamber, A, should be filled with water, so that the variation of temperature may not injuriously affect the internal parts of the gauge.

IRON DEPOSITS IN THE HIMALAYAS.

SPECIMENS of the recently discovered iron deposits in the Himalayas, Northern India, were exhibited at the Institution of Civil Engineers, Dec. 9, by Mr. W. Sowerby, Assoc. Inst. C. E. These deposits were found in the lower range of hills, called the Bhabur, at a general elevation of about 500 feet above the adjacent plains; and they were more or less continuous from the Sada river, on the confines of Nepal, to the river Ganges, a few miles above the head of the grand Ganges Canal, at Hurdwar, being about 150 miles in length.

There were six different beds of ironstone, one above the other, of varying thickness and quality. The lowest bed was a rich red ironstone associated with clay, and its thickness was, in many places, upwards of 50 feet. They contained on an average nearly 50 per cent. of metallic iron. The following was the analysis of these ores:—

Water and Carbonic Acid .	2·00
Earthy Matter	22·40
Arsenic	0·91
Lime	2·60
Peroxide of Iron	73·50
	101·41
Excess	1·41
	100·00

Metallic Iron 50·96 per cent.

The other beds were chiefly a compact brown clay ironstone, about 15 to 20 feet in thickness, containing about 40 per cent. of metal. There were also yellow hydrates and siliceous ironstones, of less thickness, and of poor quality. Masses of the richest ironstone, many tons in weight, were found lying on the hill slopes, and the beds were in numerous places seen exposed in high escarpments and deep ravines.

The enclosing rocks of the beds were micaceous sandstones, not unlike the sandstones of a coal formation; thin seams of lignitic and slightly bituminous coal had been found outcropping. Mountain limestone, of excellent quality for flux, formed part of the adjacent hills.

The district in which the iron ore was found was a dense primeval forest of Saul, Huldoo, Kya, Jamin, and other hard woods, in inexhaustible quantity, and peculiarly suitable for making charcoal. The number of small streams and large rivers issuing from the hills would afford ample water power for any amount of machinery.

The government of India decided on erecting a small experimental work during the cold season of 1855-56, which was entrusted to Mr. Sowerby; specimens of the iron produced were exhibited, and were so conclusive, as to have determined the question of the extension of the works.

The interior of the hills was also stated to contain immense deposits of rich hæmatite, specular and magnetic iron ores; likewise copper, galena, and other minerals. Views of the locality, and of the work erected, were also shown.

Specimens, of coal, iron, copper, galena, &c., discovered by Mr. Sowerby in South Eastern Africa, were likewise exhibited. The coal-beds were in the territory of Natal, and were traced from the sea-coast to the Kathlamba Mounts, a distance of about 150 miles; they varied in thickness from a few inches to fourteen feet at the outcrop. Iron, copper, &c., were found in great abundance and variety in various districts.

MACINTOSH'S NAVAL AND MILITARY INVENTIONS.

COURT OF CHANCERY, LINCOLN'S INN, DEC. 15, 1856.

(*Before the Lord Chancellor.*)

RE MACINTOSH'S PATENT.

MR. CRAIG appeared in support of a petition to have the great seal attached to this patent, notwithstanding that the time limited by the statute within which such an application was to be made had expired.

It appeared that the invention was for carrying on military and naval operations, and at the time the petitioner first proposed taking out a patent this country was at war with Russia.

The certificate of the Solicitor-General was obtained in December, 1855, but a caveat was immediately afterwards filed by the solicitor of the Board of Ordnance, at the instance of Lord Panmure, on the ground that the granting of the patent might, during that period of our war with Russia, prove detrimental to the public service, or at least be productive of much inconvenience.

The opposition of the Board of Ordnance was now withdrawn, and the petitioner asked for the usual protection to his invention.

The Lord Chancellor did not think that he had now any jurisdiction to do what the petitioner required. The Board of Ordnance had intervened, but there was no explanation of the delay from May till November. No application had been made during the time of the provisional protection.

Mr. Craig read an affidavit to show that the delay proceeded solely from the intimation given by the Government of the impropriety of taking out the patent, and that an application had been made to his Lordship by letter, before the expiration of the limitation given by the Patent Act.

The Lord Chancellor thought the explanation satisfactory; but even if there had been some remissness, his Lordship was inclined, from the peculiar circumstances of the case, and the interference of the Government on grounds of public policy, to give the provision of the statute an equitable interpretation in favour of the petitioner.

The Lord Chancellor then ordered the patent to be sealed.

COPY OF THE GOVERNMENT NOTICE OF OPPOSITION.

"*Patent Law Amendment Act*, 1852.

"1774. I, Charles George Bannister, of Pall-mall, Middlesex, Solicitor for the War Department, and for and on behalf of Her Majesty's Principal Secretary of State for the War Department, hereby give notice that I object to the Sealing of Letters Patent to John Macintosh, of Great Ormond-street, in the County of Middlesex, for the Invention of 'Certain improvements in the application of incendiary materials to be used in Warfare,' as set forth in the Warrant of the Solicitor General for the Sealing of such Letters Patent received and recorded in the Office of the Commissioners of Patents for Inventions on the 18th day of December, 1855.

"And my objections to the sealing of such letters patent are as follows:—That such an invention can only be useful in time of war, and that the publication of it may be prejudicial to Her Majesty's service. (!)

"Dated this 18th day of December, 1855.

(Signed) "CHAS. GEO. BANNISTER,
Solicitor, War Department."

The above is a case altogether unprecedented. There is no instance on record of a British Government interdicting a patent, and rendering it void during the time of war, which, in this case, was the only time it could be available to the Government and the country, and also of value to the patentee himself.

One feature of the invention is to facilitate attack on stronghold batteries on shore, enabling vessels to approach and develope their powers unmolested by any hostile fire.

This case furnishes another instance of official incapacity.

The Modern Practice of Boiler Engineering, containing Observations on the Construction of Steam Boilers; and upon Furnaces used for Smoke Prevention, with a Chapter on Explosions. By ROBERT ARMSTRONG, C. E., Consulting Engineer. Revised, with the Addition of Notes, and an Introduction by JOHN BOURNE, Esq. London: E. and F. N. Spon, 16, Bucklersbury, 1856.

To seriously review this book as a veritable Treatise on the Modern Practice of Boiler Engineering, would be simply ridiculous, as every one must see who takes the trouble to give it the most cursory inspection; and as to its containing "a chapter on explosions," it is no exaggeration whatever to say that it is itself one long chapter of explosions—explosions of ignorance, explosions of presumption, explosions of puffery, explosions of vanity, explosions of nonsense. We shall speak of it, and of its authors, with great frankness and freedom, for it is too deficient of every species of merit to have gained the respectful consideration of any one.

We avow at the outset that we should have passed the book by without a word, had it not occurred to us that it afforded an opportunity for a little agreeable retaliation, and, at the same time, for the exposure of certain charlatanry of which the public ought no longer to be kept in ignorance. Mr. John Bourne, who writes a portion of it, and revises the whole of it, sneers at the "*Mechanics' Magazine* and other oracles of corresponding authority." We will take the trouble, ere we finish these remarks, to make known what kind of an authority Mr. Bourne is. Our review of his "Catechism of the Steam Engine," published in our numbers for July 5 and 12, has already afforded our readers some light upon this point; we will endeavour to complete the matter now.

First, however, let us deal with Mr. Armstrong and his portion of this singular book. He writes three chapters; the first on

boilers generally, the second on smoke prevention, and the third on explosions. His first chapter begins with a rude assault upon Mr. C. Wye Williams, and then, under the heading "Hay-stack Boiler," enumerates certain other names which that boiler has received, but does not at all describe it. He next, under the heading, "The Waggon Boiler" says, "this boiler is, in principle, the hay-stack boiler just described," which should be "just left undescribed;" and he then proceeds to speak in general, and often in extremely arbitrary terms of the Boulton and Watt boiler, marine boilers, Kennedey's water meter, the Exhibition boiler of 1851, the elephant boiler, Dunn's retort boiler, and Galloway's boilers — especially Galloway's boilers, which he much admires, but which, as recent experience has shown, can explode terribly. This chapter contains some suggestions for a "radical reform" in marine boilers, in which the writer, or rather the talker, does not, as he says, "stick at trifles." One of the most notable of his suggestions is that, as "the draft has such difficulty to descend down after" boilers placed at the bottom of the ship, they should be placed "close up to the deck"! Another is that he would, "in fact, abolish the stoke-hole, if not do away with the stokers, and stoking also." He says the proposed elevation of the boilers would be attended by many advantages, "to say nothing of the greater safety of the ship from fire"—a subject upon which it would be well to say very little indeed, we imagine, when the boilers are to be "close up to the deck"! There is not much else worthy of notice in this chapter. The descriptions of the boilers before named are rudely given. For example, on page 49, we read, "this dome is riveted to the boiler by two cast iron necks, or short pipes 10 ins. long by 8 ins. diameter." It is from this chapter, however, that we learn how desirable it is so to improve boilers as to reach New York in six days, "for it is," we are informed, "by such achievements that nation is to be knit to nation, by bonds of undying brotherhood, and the advent is to be hastened of that peaceful kingdom, the clarion of whose renown, and the majesty of whose sceptre will command the joyful homage of mankind."!

The most important proposition laid down in the chapter on smoke prevention is that it is *economical* to produce smoke in furnaces! This chapter includes several papers and reports, dated about 1843, and mainly designed to reflect injuriously upon Mr. C. Wye Williams, to whose Treatises on the Combustion of Coal Mr. Armstrong is probably indebted for all he knows theoretically about the matter.

Mr. Armstrong has for many years acted in opposition to Mr. Williams (although he once proposed, as we have heard, to relent); but his present attack is particularly ill-timed, because Mr. Williams has recently received publicly from the Society of Arts a prize medal for his essay on the Smoke Question, after a general and spirited competition.

The third and last chapter is certainly the best portion of the book, which is not saying much in its favour. It undoubtedly contains a remark or two worthy of notice, but adds very little indeed to the well-known facts connected with the subject. There is in it, however, one solemn and imaginative reflection, which may be recorded here. After quoting from an American report, which says, "It is possible there may be a relation between the space occupied by the water and that in which the steam is formed, most favourable to the production of steam, and when this was attained, a rapid rise of elasticity took place," Mr. Armstrong adds, "In reading the above passage, and knowing that this branch of the inquiry ended there, it is difficult to help lamenting that it is as if Columbus had turned back when he was within sight of land."!

After the chapters, are added a Review of Mr. Williams' book, written *thirteen years ago*, by Mr. Bourne, and a Report on Boiler Explosions, written in America *twenty years ago*. A concluding notice informs us that Mr. Armstrong has been constrained to omit descriptions of several excellent boilers. This statement is, unfortunately, too true.

We know of no reason why we should bestow any further notice upon Mr. Armstrong, and will therefore at once pass on to that Bourne to which no scientific traveller ought ever to return.

The Artizan Club Treatise on the Steam Engine, edited by Mr. Bourne, is very well known among engineers, and it is not too much to say that Mr. Bourne's engineering reputation, such as it is, was born with and has been upborne by that work. The Reviewers—who, to a great extent, make or mar such men—accepted the book in good faith, though with too little scrutiny, and gave it a respectable position. It had a learned look about it, was tolerably accurate, and, bearing Mr. Bourne's name, was naturally thought to be Mr. Bourne's production.

We have before us, however, a printed paper, in which are arranged in parallel columns numerous quotations from the first edition of Mr. Bourne's book, and from Tredgold's work on the steam engine. The plagiarism practised upon Tredgold is

apparent in its character and most astonishing in its extent. Page after page, sheet after sheet, we have the self-same matter, with no differences between the two, but cunning changes in words and algebraical characters, and ingenious inversions in the order of the ideas. Even Mr. Bourne's publishers acknowledged the appropriation, and paid the penalty. We cannot resist the desire we feel to give our readers a specimen or two:

TREDGOLD.

Page 87.

"ON THE MOTION OF ELASTIC FLUIDS AND VAPOURS.

"Art. 128. The condition of free elastic fluids has been shown to be regulated by the pressure and temperature of the atmosphere; and, when an elastic fluid is confined in a close vessel, its condition as to temperature and pressure must be similar to that it would be in, if in an atmosphere of the same fluid, capable of producing the same pressure upon it.

"Art. 129. The most convenient method of investigating the motion of an elastic fluid, is, to find the height of a homogeneous column of the same fluid, capable of producing the same pressure as that to which the fluid is subjected; for then the fluid would rush into a perfect vacuum with the velocity a heavy body would acquire by falling through the height of the homogeneous column, when a proper reduction is made for the contraction of the aperture."

Page 91.

"The loss of velocity may be allowed for by diminishing it by one-tenth for each right-angled bend.

"If a pipe be terminated in a valve-box, the allowance of two-tenths should be made for the loss of velocity in passing the valve.

"We have no experiments by which the effect of these causes of diminution can be estimated with accuracy, but we may endeavour to allow for them on the principles which operate in similar circumstances."

BOURNE.

Page 43.

"THE MOTION OF ELASTIC FLUIDS.

"It is a well-known fact in the doctrine of Pneumatics, that the motion of free elastic fluids depends upon the temperature and pressure of the atmosphere; and, consequently, when an elastic fluid is confined in a close vessel, it must be similarly circumstanced with regard to temperature and pressure as it would be in an atmosphere competent to exercise the same pressure upon it.

"The simplest and most convenient way of estimating the motion of an elastic fluid is to assign the height of a column of uniform density, capable of producing the same pressure as that which the fluid sustains in its state of confinement; for under the pressure of such a column, the velocity into a perfect vacuum will be the same as that acquired by a heavy body in falling through the height of the homogeneous column, a proper allowance being made for the contraction at the aperture or orifice through which the fluid flows."

Page 44.

"For each right-angled bend, the diminution of velocity is usually set down as being about one-tenth of its unobstructed value.

"In the expansion valve-chest a further obstruction must be met with, probably to the extent of reducing the velocity of the steam two-tenths of the whole amount.

"We have no experiments of this sort on which reliance can be placed; and, in consequence, such elements can only be inferred from a comparison of the principles that regulate the motion of other fluids under similar circumstances."

Pages 242, 243.

"It may be assumed as a principle, that a beam of uniform thickness should not be of less thickness than one-sixteenth of its depth, otherwise it is liable to overturn.

"When the velocity is the same as that of the piston, $D^2 P l = 212\, b\, a^2$, and when $16\, b = a$ and $12\, l = n$ D, it becomes for cast iron

$$a = D\left(\frac{\frac{4}{3} P n}{212}\right)^{\frac{1}{3}},$$

Page 105.

"It may be assumed, however, as a general principle, that a beam of uniform thickness should never have its depth greater than sixteen times its thickness, because otherwise it would be liable to overturn.

Assume $16\, b = d$.

Suppose $12 l = n$ D.

"For cast iron

$$d = \left(\frac{n P}{202}\right)^{\frac{1}{3}},$$

The following remark is made in the printed paper before referred to, with reference to the last quotation:—"The pressure is given in Tredgold in circular inches, but Bourne expresses the pressure in square inches; therefore P in Tredgold is $P \times \cdot 7854$ in Bourne; thus $a = D\left(\frac{\frac{4}{3} P n}{2\,12}\right)^{\frac{1}{3}}$ where the pressure in square inches becomes

$$\therefore a = D\left(\frac{4}{3} \times \frac{P \times \cdot 7854\, n}{212}\right)^{\frac{1}{3}} = D\left(\frac{n P}{202}\right)^{\frac{1}{3}},$$

which is the expression Bourne gives."

TREDGOLD.

Page 245.

"THE STRENGTH OF SHAFTS.

"The shafts are supposed to be supported so as to render the lateral stress as small as possible, then the resistance to twisting alone has to be considered; and as no part of the shaft should be less than the bearings or journals, &c.

"If the radius $R = n$ D.

"If it revolves N times while the piston makes a double stroke.

"For cast iron,

$$a = D\left(\frac{n P}{960 N}\right)^{\frac{1}{3}},$$

BOURNE.

Page 105.

"THE STRENGTH OF SHAFTS.

"Shafts are in general so supported as to render the lateral stress as small as possible; hence we have only to consider the resistance to torsion. No part of the shaft should be less than the bearings or journals, &c.

"Suppose the shaft makes n revolutions for each double stroke of the piston, and suppose also $R = m$ D.

"For cast iron,

$$d = D\left\{\frac{\cdot 7854 m \times P}{960 n}\right\}^{\frac{1}{3}},$$

These expressions are, as the paper remarks, identical, as n in Tredgold is m in Bourne; N in Tredgold n in Bourne; P in Tredgold $\cdot 7854$ P in Bourne; a in Tredgold d in Bourne; and D the same in each.

We might, if it were in the least desirable, proceed very, very much further with such quotations; and then go on to show that Mr. Woolhouse's investigations relating to the Crank, given in the Appendix to Tredgold, have also been transferred to the other book, with their α's transformed to ϕ's, their r's to ρ's, and their ρ's to r's, in

a most astute fashion. And as their typographical errors are most devotedly preserved, we may well question how far they were comprehended by the individual whom we will mildly call the *borrower*. Barlow's paper in the Appendix is honoured in like manner with Woolhouse's.

We feel that comment on all this is wholly unnecessary. Our readers will now entertain a more just estimate than heretofore of Mr. Bourne's authority. We have endeavoured to perform our duty in the matter as pleasantly as possible, and we now offer Mr. Bourne a literary ticket-of-leave, strongly urging him at the same time to avoid being seen again with injurious associates, and, above all, not to dream henceforth of sitting in judgment upon any scientific work whatever.

THE CRYSTAL—THE PEOPLE'S PALACE, SYDENHAM.

NO. II. A GLANCE AT THE PALACE AND ITS CONTENTS.

THE first rays of the rising sun now fall —as they once fell on the giant statues of the Memnonium—on the lustrous roof of a stupendous building, and thus light a beacon of human intelligence and information, which is seen from a great portion of the south-eastern counties of England. From whatever side we approach that palace, it is a marvellous sight, uniting the light of earth with that of the heavens —a view incomparably surpassing that of the Crystal Palace in Hyde Park. If the most learned Brahmin or other priest of distant lands were suddenly placed within sight of it, he would certainly never divine that such a building is intended, not for the dwelling-place of any individual or dynasty, *but* for the great *recreation* and amusement-place of a whole people! Huge temples of gods, and huge dwellings of men, have existed before; but a people's building like this has no parallel in history. It arose magic-like, no one knowing what it would be even in its material extent, just as no one seems yet to know what it is destined for.

I think that, ultimately, an entrance (portico) and avenue should be formed on its eastern or north-eastern side, so that the visitor should arrive facing the central part of that wonderful transept which rises as high as the pyramids. But even the present entrance from the London railway-station is most pleasing, as it opens to us a sight of the gorgeous and smiling parterre of the garden—vaster I think, than that of Versailles. Then we ascend, and arrive at the entrance of the building, whose stupendous height and extent had gradually displayed themselves before our eyes.

But the interior! Goethe said of the frescoes of Michael Angelo, at Rome, that he went to see them to widen his heart and sight; but neither the one nor the other lived to see such a miracle of modern thought, fancy, and skill, as is here displayed before our eyes—

"Fanum, templumque populi maximum."

Imagine a building of vast dimensions—one not confined by walls or an opaque roof, but where many thousands of cubic feet of *light* are isolated by iron and glass! Men's minds conceive everything, get used to everything; but twenty years ago, a person would have been thought insane in depicting such a structure. To a person somewhat *read*, the effect is the more surprising, as he recognises successively all those figures and images which through life had occupied his imagination. The Farnese Hercules, the Colossi of Monte Cavallo, and such like, heave successively in sight. It is not a museum, a gallery, a collection, which the people may see here; but all the museums, and galleries, and collections of the world, as far as human means and ingenuity can collect them. The entwining of exotic and tropical plants and flowers with the glare and splendour of these various courts, and thousands of sculpture groups, statues, and busts is most fortuitous, and will be still more so when increasing receipts enable the Company to procure novel and extraordinary plants like the Doryanthes excelsa, arborescent Banksias, Proteaceæ, gigantic Orchideæ, &c.

But the greatest study for man is man himself, and the *Bust Collection* of the people's palace shows us all the galaxy of that host of the great, who in every age and country have illustrated and embellished man's history. No individual or family could ever have possessed such a collection, any more than we could place within the space of the largest fishpond the vast broods of the ocean. And no one can gaze without religious awe at the heads of the great founders of religions, legislators, reformers, improvers of their country in structures and enterprise, philanthropists—men great in science, art, industry, charity, &c. This is a collection to be viewed and enjoyed with *discretion* by the thinking, because it is too much for the intellect of the individual to be placed opposite such deeps of thought, fancy, *reverie*, love, and enthusiasm as are beheld in these thousand, upon thousand faces. And thus this collection may become a Pantheon of British, Colonial, and world fame; and the placing of one's bust there may become a ceremony akin to the coronation of poets in the Capitol of Rome; if our *generalising* age

should, at a subsequent period, produce men and women worthy of this distinction. Here, also, as in the Olympian games of ancient Greece, our *youthful* orators, philosophers, legislators, artists, and gymnasts might compete for excellence and fame; because whatever that is worthy which *has* once been, will re-occur again, after the lapse of ages, although never in the same shape, but improved and more elevated. It is only the utterly worthless and baneful for which, once destroyed, there will be neither resurrection nor redemption.

J. LOTSKY.

15, Gower-street, London.

HEARDER'S INDUCTION COIL.

To the Editor of the Mechanics' Magazine.

SIR,—Like many of the readers of your valuable Magazine, I feel greatly indebted for the information you so liberally afford from time to time, and since you first noticed the labours of Mr. Hearder, now some weeks ago, I have been looking anxiously for the time when you would give us some details of his machine, the results of which no doubt astonished and interested many who read them. I need not tell you how carefully I read your description of it in the Magazine of Saturday, Dec. 13, and although I cannot subscribe to all you say I am glad you have put us in possession of some facts connected with it. You tell us for example, that Mr. H. has the merit, not only of constructing the first successful statical induction coil in England, but also that in his first attempt he has far exceeded the French manufacturer, M. Ruhmkorff. If the latter part of this statement is true—and without knowing the conditions under which their comparative merits were tested, I would not venture any opinion on the subject—and great as the results which Mr. H.'s coil is said to have given, I think it can scarcely be said to be the first successful one constructed in England. Success, I apprehend, does not mean merely the obtainment of a given length of spark, but the result, as compared with the material employed. Mr. H. may have constructed the largest coil, and may have obtained the greatest length of spark in dry air, and yet not be entitled to the credit of making the first successful induction coil in England. I have lately seen one about 6 ins. long by 1¾ diameter, having only about 130 yards of secondary wire, which, with six cells of a Smee's battery, gave sparks quite one-sixteenth of an inch in air. The separation of the layers, which you consider peculiar to Hearder's, is also adopted in this, the difference being that drawing paper well saturated in a hot solution of shellac dissolved in spirit of naphtha was used instead of the oiled silk or thin gutta percha employed by him. The wire was cotton covered, and farther insulated by melted shellac, like Mr. Hearder's. Now, considering the materials employed, I think you can scarcely consider such results unsuccessful. I also, two years ago, saw one in the possession of Mr. Allan, of London, which is also of English construction, and which yielded sparks three-eighths of an inch with a Smee's battery much inferior in intensity to that with which Mr. Hearder's experiments have been conducted. The dimensions of the reel on which the first coil was laid by Mr. H. rather surprised me, inasmuch as they appear to be inconsistent with a good application of the materials employed. I will not, however, trespass further upon your valuable space at present, hoping you will soon give us such additional facts as will enable us more clearly to comprehend the merits of the improved induction coil.

I am, Sir, yours, &c.

J. F.

Sheerness, Dec. 16.

[We are glad that our remarks on Mr. Hearder's induction coil have elicited the results of the labours of others, but we do not see anything in the remarks of our correspondent to make us change our opinion, with regard to Mr. Hearder's priority and success. We should not have designated his machine a successful one, if he had not produced effects in all respects at least equal to those of M. Ruhmkorff with the same materials and battery power. Mr. Hearder has, however, achieved even more than this, for his first machine produced far greater effects with one-third the quantity of wire, and under the same exciting battery, since it appears that his machine of 6 inches long was tested against one of Ruhmkorff's of 12 inches in length, and containing three times the quantity of wire, at the Plymouth Mechanics' Institute in March of the present year, by an eminent electrician of London who was lecturing on the subject, the same battery being applied to each machine. The superior effects of Mr. Hearder's arrangements were evident to all. We certainly look upon the absolute increase of effect as an essential element in success. The practical utility of the machine is enhanced by its absolute increase of power; for although the small effects mentioned by our correspondent may have been great in relation to the quantity of wire used, yet it must be remembered that the difficulties accompanying the extension of the principle to the production of higher effects increase in a greater ratio than the effects themselves; and the insulation which may be adequate to produce a small effect, would altogether fail

when the machine is constructed of larger dimensions. Independently of this there are certain effects which are not developed by low degrees of power, and which would never have been discovered but for the high power obtained by Mr. Hearder's arrangement. If we may be allowed to use a homely simile, a flea is infinitely stronger in proportion to its size than an elephant, but all the fleas in the world put together would not do the work of an elephant. We learn that Mr. Hearder is engaged in constructing machines of still greater power, and that he has recently invented an apparatus which can be easily applied as a standard of comparison, not only between different machines, but between the effects of the induction coil and those of the electrical machine. ED. M. M.]

THE PATENT OFFICE LIBRARY.

To the Editor of the Mechanics' Magazine.

SIR,—The Patent Law Commissioners allow the public freely to consult specifications and books in the patent office library. Scientific authors and foreign governments have generally added their works to this collection. Models, portraits, diagrams and drawings have been presented by other liberal donors. The librarians and officials are exceedingly courteous to readers and inquirers. Barristers, solicitors and agents, scientific men and women, inventors and would-be inventors, British, foreign and American, crowd around this attractive collection. The government derives an income of more than 30,000*l.* a year from patents paid for by these very people. Yet the Patent Law Commissioners throw all those barristers, solicitors, agents, inventors, men and women, specifications, books, drawings and librarians into a room, positively not so large as the smallest ragged school in London.

I am, Sir, yours, &c.,
ONE OF THE CRUSHED.

MODERATOR LAMPS.

To the Editor of the Mechanics' Magazine.

SIR,—In answer to your correspondent, I would observe that camphine is quite as combustible as naphtha, but that it may be remarked that no case of accident has occurred with either that is not referable to the grossest carelessness, although thousands have burned and do burn naphtha and camphine.

The use of camphine is precluded in the moderator lamp, on account of this inflammability; for were it forced up by the pressure of the spring in greater quantities than required, as the oil is in the moderator, the returning portion would inflame in its descent and fire all contained below. To avoid the effects of this property, the wick is placed somewhat tightly between two metal plates in the Cochrane lamp, and between two concentric cylinders in the Vesta lamp.

Camphine has moreover these two disadvantages, it attracts oxygen from the atmosphere, by which a portion is precipitated in the form of resin, which, being dissolved immediately on its formation, vitiates the whole capabilities of the fluid for burning, by causing the lamp to die gradually out; and it has some inherent, inseparable, volatile principle which *cannot* be burned, which is the cause of the smell observed, and the dryness of the throat that is felt in rooms where camphine is burning.

The great run of the moderator cannot be traced to its merits either in economy, power, or cleanliness, and certainly not for simplicity. It is but a clumsy parody on the beautiful mechanical lamp of Carcel. Brought before the public by the Exhibition, and eagerly seized by the lamp-dealers it became a fashion and a mania; but even now it is to be found in deplorable disorganization, side by side with the old camphine, solar, and candle lamps in the shops of the marine-store dealers about town.

I am, Sir, yours, &c.,
HORATIO BROADSTADT.

LONDON MECHANICS' INSTITUTION.

To the Editor of the Mechanics' Magazine.

SIR,—From the great interest you and your subscribers have evinced in the prosperity of this Institution (as evidenced by the readiness and liberality with which some of your readers have come forward to its assistance), I am led to believe that you will still further assist us by allowing your paper to be the medium of communicating to the public, that the members of the Drawing Classes of this Institution intend having an Exhibition of drawings, &c., on the 3rd, 5th, and 6th of January, 1857, to which the public will be admitted free by tickets, to be obtained in the Library of the Institution, or by letter addressed to myself.

The exhibition will be entirely confined to the productions of members of the various drawing and modelling classes, and I believe that most of them will possess sufficient merit to convince the public that the institution, although considerably depressed by want of funds, and thereby prevented from attaining that high degree of excellence it so anxiously desires to

attain, is nevertheless pursuing a career useful to the community at large, and is worthy of the public support it so much needs and confidently seeks.

Thanking you for the powerful aid you have already afforded us,

I am, Sir, yours, &c.,
G. W. EAGLE, Hon. Sec.,
Exhibition and Special Class Sub-Committees.

December 23rd, 1856.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

BARLOW, P. W. *An improvement in seasoning timber.* Dated Apr. 18, 1856. (No. 933.)

This invention consists in causing air to pass through the timber in such manner as to drive out the sap, and, when the timber has been impregnated with liquids of a preservative character, the air is used to drive out such fluids.

JENNINGS, J. G. *Improvements in pumps.* Dated Apr. 18, 1856. (No. 934.

In this invention the piston rod has a piston at each of its ends, and, by preference, double cup pistons are used. These pistons work at the two ends of a long barrel or cylinder. The central part of the barrel has a slot at each side, through which a pin from the piston rod works, and by means of connecting rods and a crank axis, or other suitable gearing, the pump-rod receives its to-and-fro motion. One end of the barrel is covered with a moveable cover; the valve-box is formed with, or is fixed to, the other end of the barrel. From the valve-box a pipe communicates with the covered end of the barrel. The valve-box is arranged with four valves, two induction and two eduction.

MORET, C. *Improvements in rotatory steam engines.* Dated Apr. 19, 1856. (No. 935.)

These improvements consist—1. In constructing the main shaft or axis with two steam passages in the manner of a two-way cock. 2. In a method of regulating the ingress and egress of the steam.

HUNT, E. *Improvements in Hansom cabs and similar vehicles, parts of which improvements are also applicable to other carriages.* Dated Apr. 19, 1856. (No. 938.)

This invention consists—1. Of an improved door, or arrangement for closing the passage of ingress in Hansom cabs, and giving to the driver the means of opening and closing the same from his seat, which is accomplished by using some flexible material wound on to or off a roller placed in a suitable position under the cab. The inventor also has an arrangement for giving to the passenger as well as driver the means of closing or opening the door. 2. In the adaptation of mechanical contrivances to cabs as at present in use for enabling the driver of the vehicle to open and close the doors of the same from his seat.

STANSBURY, C. F. *A new instrument for determining the position and bearing of ships at sea.* (A communication.) Dated Apr. 19, 1856. (No. 939.)

This invention consists in the construction of an instrument denominated the England Sextant, the said instrument being adapted to determining latitude, time, azimuth, and altitude, and also declination. It cannot be described without engravings.

ADKINS, W. *Measuring fabrics, which he proposes designating the Automaton Measurer, or Drapers' Assistant.* Dated Apr. 19, 1856. (No. 940.)

The object is to provide a neat and portable machine, whereby the vendors of woven fabrics may expeditiously and smoothly roll, block, card, and accurately measure such fabrics as they may deal in. The machine cannot well be described without engravings.

WILKES, T. *A new or improved method of manufacturing tubes of copper and alloys of copper.* Dated Apr. 19, 1856. (No. 941.)

This invention consists in manufacturing tubes of copper, or alloys of copper, by rolling thick hollow cylinders between grooved rolls, the grooves in which the rolling is effected being semicircular in cross section, or of a curve consisting of a less portion of a circle than a semicircle.

CROSLEY, W., and J. GOLDSMITH. *Improvements in wet gas-meters.* Dated Apr. 19, 1856. (No. 945.)

These improvements consist — 1. Of a self-acting arrangement for compensating for the evaporation of the water in the meter, by which arrangement the true water level is maintained. This is effected by the employment of a rotary apparatus suitable for raising water, which delivers the water into a reservoir communicating with the water in the measuring chamber, &c. The invention relates — 2. To supplying the meter with water, and consists in connecting the water supply pipe with the tube through which the upright shaft passes, whereby one pipe only is required to dip into the water. 3. To the adjustment of the height of the overflow pipe by a screw thread made on the outside of it, and working through a corresponding nut or screwed plate. 4. To the venting of the waste water chamber, and consists in making an air passage in the thickness of themetal forming the discharging spout or nozzle, such passage communicating by a pipe with the

upper part of the waste water chamber, and so made as to be closed by a washer on the discharge plug. 5. To a construction of overflow pipe whereby the water is drawn off below the actual lip or edge of the overflow pipe, after it has ceased to run over the top of the same, and whereby the water is prevented from mounting above the edge or lip of the overflow pipe after it has once ceased to run. This is effected by placing a small syphon near the top of the overflow pipe, the mouth of the short leg being outside the pipe, and slightly below its edge or lip. 6. To an arrangement for stopping the supply of gas through the syphon pipe of ordinary gas-meters, should the water line be raised above the proper level. This is effected by placing an inverted cup or cap over the top of the syphon pipe, which will be sealed by the water if it rises too high, and which cup or cap is made adjustable vertically.

BOUWENS, F. J. *A new rotative steam engine.* Dated Apr. 19, 1856. (No. 946.)

This invention consists of a new rotative steam engine, which is an improvement on the rotary for which letters patent were granted to the patentee 24th October, 1854. The chief characteristic of the invention consists in the mechanical application of reservoirs of power to the motor or rotating part of the engine, by arrangements analogous in principle to those patented as before mentioned.

NASMYTH, J., and H. MINTON. *Certain improvements in machinery or apparatus employed in manufacturing tiles, bricks, and other articles from pulverized clay.* Dated Apr. 21, 1856. (No. 948.)

This invention consists in so constructing the eccentric shaft which actuates the compressing die or dies that each rotation thereof shall effect the first compression of the pulverized clay in the die box, then release the compression to allow the confined air to escape from among the particles of pulverized clay, and then effect the final consolidating compression.

MELLOR, S., and T. YOUNG. *Certain improvements in machinery for supplying water to steam boilers.* Dated Apr. 21, 1856. (No. 949.)

This invention consists in improvements upon the machinery for which letters patent were granted to the patentees 1st August, 1855. It cannot be described without engravings.

CHAMBOR, J. A. M. T. *Improvements in fire-places.* Dated Apr. 21, 1856. (No. 952.)

This invention refers—1. To the closing of the recess of a fire-place, by means of a plate of metal, in the manner of a register stove, but having thre adjustable openings or passages in it, two in the upper part and one in the lower part thereof. 2. It refers to the means of controlling the lower and upper currents of air—that is, the currents passing through the upper and lower openings in the stove. This part of the invention requires engravings to illustrate it.

MAUGHAN, W. *An improvement in the preparation or manufacture of starch.* Dated Apr. 21, 1856. (No. 953.)

This invention consists in preparing starch which shall render the fabrics to which it may be applied incapable of transmitting flame or fire. The starch, having been manufactured, is saturated or mixed with phosphate of ammonia and a small quantity of muriate of ammonia, and afterwards dried or prepared to render it suitable for the market.

HANSOR, J. *Improvements in the manufacture of illuminating gas.* Dated Apr. 21, 1856. (No. 954.)

The substances which the patentee employs to form an improved compound to be substituted for coal in obtaining gas are peat, resin, coal-tar, and resin-oil, or other oleaginous matter, in about the following proportions, viz., peat, 12 parts by weight; resin of commerce, 12 parts; coal-tar, 8 parts; and resin-oil or other oleaginous matter, 16 parts. For mixing the substances, he uses an ordinary pug-mill, and thus produces a pasty compound ready for conversion into gas.

CANTELO, W. J. *Improvements in the preservation of vegetable matters.* Dated Apr. 22, 1856. (No. 955.)

This invention relates to a peculiar method of desiccating fruits, esculents, plants, roots, seeds, and other vegetable matters, by means of hot-water hearths, plates, pipes, and like arrangements, which cannot be described without engravings.

SYMONS, A., and E. BURGESS. *Improvements in instruments for ascertaining and indicating heat, and also in the parts for making and breaking contact in electric circuits used therewith.* Dated Apr. 22, 1856. (No. 957.)

This invention relates, first, to the combination of metals to be employed with a suitable scale or dial to afford visible indication of gradations of temperature, and to actuate apparatus whereby an audible signal will be created, being an instrument applicable for making and breaking the contact of electric circuits used for this purpose. The improvements consist in combining a plate or strip of gold with a plate or strip of zinc, soldered together throughout their length. Another combination consists of a strip of steel united with a strip of gold. The improvements in the points of contact for making or break-

ing the electric circuit consist, first, in placing one of the points so as to rub along a grooved surface, when affected by the movement of the compound metal instrument before described, which groove is formed of non-conducting material, whereby the point will be cleaned. The rubbing of the point on the conducting surface will also clear that surface. The electric circuit is so arranged in connection with an alarum apparatus, that when the instrument indicates a given temperature, it will be discharged and give audible notice.

SYMONS, A., and E. BURGESS. *Improvements in apparatus for producing alarums to indicate burglary by means of electricity.* Dated Apr. 22, 1856. (No. 958.)

These improvements consist of several methods of effecting the contact at the brakes in electric currents employed to discharge alarums.

COMPLETE SPECIFICATIONS FILED WITH APPLICATIONS.

HOWELL, F. B. *Certain improvements in machinery for making corks.* Dated July 18, 1856. (No. 1688.)

This invention cannot be described without engravings.

ONIONS, J. *Improvements in the manufacture of iron.* Dated July 23, 1856. (No, 1742.)

The applicant proposes to apply at the tuyere of the blast or other furnace, the smoke, heated air, and inflammable gases produced from fires of any kind whatever, to be consumed in passing through the fused mass of ore or iron in the furnace. Also to prepare fuel of any combustible kind whatever, so as to apply it at a high temperature in the shape of smoke, with heated air and other inflammable gases, or in finely pulverised particles at the tuyere of the furnace, so as to come into immediate contact with the ores or iron in a state of fusion or cementation in the furnace. Also to introduce fuel generally into the furnace somewhere at or near the junction of the boshes and shaft, or anywhere in the shaft, but by preference near the bottom.

THATCHER, R. *Certain improvements in preparing for doubling or spinning cotton or other fibrous substances.* Dated July 29, 1856. (No. 1792.)

The applicant subjects the coils from the condensing carding engine to a succession of easy draughts, by which means he obtains a result in the case of sweepings not before arrived at. The machine best adapted to carry out the object—the obtainment of a succession of easy draughts—are the slubbing frame and dyer frame.

SHAW, W. F. *An improved burner or apparatus for the combustion of air and inflammable gas.* Dated Aug. 1, 1856. (No. 1826.)

This invention cannot be described without reference to engravings.

BORLAND, J. Y. *Improvements in machinery for preparing and spinning fibrous materials.* Dated Aug. 6, 1856. (No. 1854.)

In this machinery the applicant reverses the principle of drag, that is he drives the spindles positively, and in the usual way of mules and throstles at a uniform speed, and drags the fly by means of the thread. The fly being made very light, and the top point of very small diameter requires almost no power to move it, and gains no centrifugal force which can obstruct the variations of winding. The arrangement cannot be described without engravings.

WOODMAN, J. *An improved telegraph insulator.* Dated Aug. 8. 1856. (No. 1868.)

This invention is precisely the same as No. 335, which was not proceeded with, but described at page 277 of No. 1728.

POITIERS, E. *The application of a new material or materials for the manufacture of brooms and brushes in general, and for other purposes, and for improvements in the manufacture of street scavengers' and other brooms and brushes.* Dated Aug. 29, 1856. (No. 2011.)

This new material is the rib or spine running through the centre of the leaflet of the palms, and forming at its base the footstalk by which the leaflet is attached to the leaf stem. The invention as to improvements in brushes refers to the admixture of the new material with those now in use, or hereafter to be used, whether to give support and greater stability to weaker materials, or to lessen the cost of the brush or broom; and further, where the bases or thicker ends of the ribs are used, a manner of applying them by which the use of wire, pitch, or any fastening will be rendered in many, if not all cases, unnecessary.

MAGNUS, L. S. *Improvements in the manufacture of coke.* (A communication.) Dated Sep. 1, 1856. (No. 2033.)

The object of this invention is to produce a description of coke heavier and harder than that now in use, and possessing superior heating power. To attain this object the inventor mixes pulverized coals of different varieties in such proportions that there may be a much less quantity of the useful elements of the fuel dissipated in the process of coking than is necessarily consequent upon the ordinary practice in which bituminous coal is alone employed.

BOUSFIELD, G. T. *An improvement in flying or roving frames.* (A communication.) Dated Sep. 9, 1856. (No. 2103.)

The inventor has provided that the bob-

bin spindle shall have no connection with the flyer, and shall be of no greater length than is necessary to fulfil its purpose as an axis for the bobbin to revolve upon. This is accomplished by making the neck of the flyer of sufficient length to receive bearings in the upper and lower sides of a box running lengthwise of the frame, through which passes a shaft communicating motion by bevel gears to a spur gear working upon a stud centred upon the middle point of the diagonal lines passing through the bearings of two nearest opposite flyers, and meshing into pinions upon the necks of the flyers. Both front and back lines of flyers are thus driven by one and the same shaft, instead of two shafts. The bobbin spindle may be fixed in the lower rail and be stationary, the bobbins resting upon the bevel gears worked by the present bobbin driving shaft, and revolving about the bobbin spindle as an axis.

DUMÉRY, C. J. *Improvements in apparatus for counting, registering, and indicating the distance travelled by vehicles, and the speed and time of travelling.* Dated Sep. 11, 1856. (No. 2131.)

The inventor describes certain apparatus, the object of which is to ascertain the time, the speed, the distance run, the drive by time paid for, the drive by time unpaid for, the time at rest paid for, the time at rest unpaid for, the speed during a drive paid for, the speed during a drive unpaid for; journeys or drives performed paid for according to distance, journeys or drives performed according to distance but unpaid for; and finally, the drives which he calls mixed—that is, where the drive is at a determined fare for the distance run or time occupied in the drive, and at a different fare for the time in walking or time at rest. The apparatus cannot be described without engravings.

JENKINS, H. *Improvements in the manufacture of buckles and other dress fasteners.* Dated Sep. 29, 1856. (No. 2281.)

This invention cannot be described without engravings.

GILBERT, T. *An improved pianoforte action or string sounding mechanism.* (A communication.) Dated Oct. 10, 1856. (No. 2382.)

In this invention the jack or fly is dispensed with, the devices employed for elevating the hammer being so arranged and actuated as to always maintain upon the key-lever the weight of the said hammer while it is in action, the same rendering the hammer sensible to the slightest downward movements of the key. The invention cannot be described fully without engravings.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

STANSBURY, C. F. *An improved mode of splicing and fastening the adjacent ends of the rails of a railway track.* (A communication) Dated Apr. 18, 1856. (No. 926.)

This invention consists in securing the joints of the rails of the permanent way by the employment of long splice pieces or beams of wood, securely attached on one or both sides of the rails.

GARDNER, E. V. *Improvements in furnaces.* Dated Apr. 18, 1856. (No. 929.)

This invention consists in improvements upon an invention dated 14th March, 1855. In the interior of the deflecting plate therein described, whether of metal or fire clay, the inventor arranges a pipe or tube, or series of pipes or tubes, which are continued into the boiler, and bent into a spiral or other form, to afford a large extent of surface to the water in the boiler. The object is to cause the heat of the furnace, which is at present liable to destroy the deflecting plate, to be conveyed to the water in the boiler.

BLACKBURN, T. *Improvements in preparing for spinning cotton-waste and silk-waste.* Dated Apr. 19, 1856. (No. 937.)

The inventor has found that he can dispense with the use of the carding engine in such preparing, and by affixing a "silver tin" to the hard waste breaker, and attaching or employing in connection therewith drawing boxes, he combines the several machines into one, and prepares cotton-waste and silk-waste at one operation.

VARILLAT, W. J. J. *Improvements in the apparatus for the extraction of colouring, tanning, and saccharine matters from vegetable substances.* Dated Apr. 19, 1856. (No. 942.)

This invention consists of an apparatus formed by a number of cylindrical vessels, made to communicate with each other by means of cocks placed at the top and bottom with trellis-work, and the upper ones above other trellis-work, which rests on the matter to be treated, which is placed in each cylinder so as to allow the liquids to pass through. The cylinders are placed on a turning platform, so that each time one is emptied or filled the cylinder may be placed in a right position.

HAZARD, R. *A heat extractor for extracting the heat from the smoke or heated gases in its passage from boilers, stoves, or furnaces to the chimney, and rendering the economized heat available for drying and warming purposes.* Dated Apr. 19, 1856. (No. 943.)

This heat extractor consists of a number of pipes, secured at each end to iron plates,

with sockets corresponding to the number of pipes, and with a door conveniently placed for cleansing the interior of the pipes. The extractor is placed in a brick chamber near the boiler, stove, or furnace, and the heated gases are made to pass through the pipes before entering into the chimney. Fresh air is then brought into the bottom of the chamber, becomes warmed by coming in contact with the external surface of the pipes, and passes off into the room requiring artificial heat.

LONGBOTTOM, A. *Improved means of lighting and ventilating mines.* Dated Apr. 19, 1856. (No. 944.)

The object of this invention is to generate illuminating gas by the application of the heat derived from the fuel used in creating a down draught to coal and other mines. The inventor introduces into the mine to be ventilated any suitable arrangement of oil gas apparatus, and this apparatus he sets to work by supplying the furnace with fuel, and the retort with oil or melted fat. A draught will thus be created, and the heat generated by the burning fuel will heat the retort, and vaporize the oil as it falls therein from a reservoir. The resulting gas he conducts by means of pipes into all parts of the mine requiring illumination, and consumes it in fixed gas burners.

HEYNS, P. *Improvements in railway wheels.* Dated Apr. 21, 1856. (No. 947.)

The inventor prepares a cast or wrought iron circular ring having on it a suitable flange. He similarly prepares a cast or wrought iron nave, having a perforation in the centre for the axle. Having placed the tyre and nave in their relative positions, he fixes on them and to them two wrought or cast iron discs or plates, one on each side, firmly bolted, screwed and riveted, and of a diameter nearly equal to the tyre or rim.

DORTET, J. *An improved padlock.* Dated Apr. 21, 1856. (No. 950.)

The improved padlock is so contrived as to prevent the bolt being acted on by the felonious insertion of any instrument. It cannot be described without engravings.

OWEN, W. *Improvements in the modes of attaching buttons to wearing apparel.* Dated Apr. 21, 1856. (No. 951.)

This invention consists in substituting metallic fastenings for the sewing ordinarily employed in the attachment of buttons and similar fastenings to articles of dress.

PROVISIONAL PROTECTIONS.

Dated October 27, 1856.

2518. John Fordred, of Islington, gentleman. Improvements in lamps, in apparatuses connected therewith, and in manufacturing certain liquids for the production of light. Partly a communication.

Dated November 22, 1856.

2772. William Kemble Hall, London, engineer. Improvements in machinery for cutting, punching, and shaping metals.

2779. William Edward Newton, of Chancery-lane, civil engineer. Certain improvements in railway carriages. A communication.

Dated November 25, 1856.

2791. John Bond, of Burnley, Lancaster, machine and tool maker. Improvements in machinery for counting and indicating the number of revolutions performed by rollers and shafts.

Dated November 26, 1856.

2799. John Musgrave, jun., of Bolton-le-Moors, Lancaster, ironfounder. Improvements in the construction of cloth beams for beetles.

Dated November 28, 1856.

2814. Peter Walker, of Warrington, Lancaster, brewer. Improvements in brewing and in the machinery or apparatus employed therein.

2816. Camille Auguste Tissot, of Rue de l'Echiquier, Paris. Improvements in the production of motive power, and in the apparatus connected therewith.

2818. Joseph M. Saunders, of Dublin. Improvements in cooking ranges.

2822. Michael Allen, of Cavendish-grove, Wandsworth-road, engineer. Improvements in the slide valves of steam engines.

Dated November 29, 1856.

2824. Charles William Siemens, of John-street Adelphi. Improvements in fluid meters.

2826. William Johnson, of Lincoln's-inn-fields, engineer. Improvements in projectiles. A communication from N. Schofield, of Norwich, U.S.

2828. Laban Clarke Stuart, of New York, U.S. Improvements in machinery for reducing fibres to pulp. A communication from J. Kingsland, jun.

2830. Edward Senior Atkinson, of Knottingley, York, manufacturing chemist. An apparatus for condensing vapours, fumes, gases, and smoke arising from chemical and smelt works.

2832. Richard Harmer, of Princes-street, Spitalfields, clerk. Improvements in stereoscopic pictures.

Dated December 1, 1856.

2834. Charles Henry Gilks, of Union-row, Tower-hill. An improved stand for umbrellas for railway and other carriages.

2836. John Gedge, of Wellington-street South, Strand. Improvements in lubricating the journals of the axles of railway vehicles or other moving parts of machinery. A communication from A. Macpherson, of Brussels.

2838. John Coope Haddan, of Cannon-row, Westminster. Improvements in pianofortes.

2842. George Julius Vertue, of Northam, Southampton, merchant's clerk. An improvement in deodorizing sewage waters and sewage matter, when lime is used.

2844. John Carter Ramsden, of Bradford, York, stuff manufacturer. Improvements in apparatus or the mechanism of looms for weaving a certain class of plaids, checks, and fancy woven fabrics.

2846. Noël Monnier, of Paris, coachman. Improvements in bridles and bits for stopping horses.

Dated December 2, 1856.

2848. Frederick Cornwall, of Birmingham, builder. Certain improvements in the construction of fire-places applicable for general purposes, whereby combustion is rendered more perfect and capable of regulation or control, smoke thoroughly consumed, and the draught in open fire-places much increased.

2850. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in pumps and in pumping. A communication.

2852. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. A chemical composition or agent to be employed in the dyeing of wools and woolens. A communication from M. Lipman.

2854. Louis Dominique Girard, of Paris, mechanician. Certain improvements in hydraulic turbines.

2856. James Apperly, of Dudbridge, Gloucester, cloth manufacturer. An improved fabric applicable to the manufacture of feed cloths or aprons.

2858. Matthew Townsend, of Leicester, fancy hosier. Improvements in machinery for the manufacture of knitted fabrics.

2860. John Hall Brock Thwaites, of Bristol, dentist. An improved screw bolt, or fastening, for ship building and other purposes.

Dated December 3, 1856.

2863. Philipp Kurten, of Cologne, Prussia, soap manufacturer. Improvements in the manufacture of mottled soap and yellow soap.

2864. Frederick Albert Gatty, of Accrington, Lancaster, manufacturing chemist. Improvements in the construction of filters or drainers.

2865. Emory Rider, of Cannon-street, City, gentleman. Improvements in the manufacture or treatment of gutta percha.

2867. Adam Bullough, of Blackburn, Lancaster, manufacturer, and William Bullough, of the same place, machinist. Improvements in looms.

2868. Henry Genhart, of Liège, Belgium, armourer. Improvements in fire arms and ordnance, and of the cartridges or projectiles to be used therewith.

2869. Julien Denis, of Queenhithe, City. Improvements in apparatus for corking and uncorking bottles without leaving any air between the liquid and the cork. A communication.

2870. Joseph Deeley, of Mile End-road, engineer. Improvements in furnaces for smelting and melting.

2871. James Kinder Cheetham, of Rochdale, Lancaster, doctor of medicine. Improvements in the application of photographic pictures to metal and other surfaces, and in rendering the same applicable as printing surfaces.

2872. William Edward Newton, of Chancery-lane, civil engineer. Improved processes for ornamenting metallic surfaces, and for producing surfaces in intaglio, or in relief, for printing purposes. A communication from C. Nègre, of Paris.

Dated December 4, 1856.

2873. Aimé Lecocq, of France, contractor. Improvements in hydraulic engines.

2874. James Apperly, cloth manufacturer, and William Clissold, engineer, both of Dudbridge, Gloucester. Improved machinery for preparing fibrous substances for spinning.

2875. Louis Bayer, of Soho, Middlesex. An improved stuffing to be used in place of hair or other substances in which such articles are commonly employed.

2876. Isaac Livermore, of Shrubland-grove East, Queen's-road, Dalston. An improvement in waterproofing paper.

2877. Laban Clarke Stuart, of New York, U.S. Improvements in drying sized paper. A communication from J. Kingsland, jun.

2879. Daniel Barnard and David Lichtenstadt, of High-street, Whitechapel. Improvements in tanning.

2880. John Simon Holland, of Woolwich, Kent, engineer. Improvements in the manufacture of iron, part of which is applicable to other purposes.

2881. William Henson, of Buckingham-street, Caledonian-road, Islington, engineer, and Henry Palmer, of Newman-street, Oxford-street, architect and surveyor. Improvements in sewing or stitching machines.

2882. Auguste Edouard Loradoux Bellford, of Bedford-street, Strand. Improvements in drying, burning, and cooling bricks, tiles, and other ceramic substances. A communication.

2883. Louis Joseph Frédéric Margueritte, of Paris, chemist. Improvements in treating or preparing materials to be used in manufacturing retorts, crucibles, bricks, and other kinds of earthenware.

2884. David Crawford, of Glasgow, manager. Improvements in washing, cleansing and preparing textile fabrics and materials.

Dated December 5, 1856.

2885. Robert Davison and Joshua Crowther, of Limerick. Improvements in machinery for winding yarns or thread on bobbins or pirns fixed on spindles driven by gear or cogged wheels, and for winding weft, for either hand or power looms.

2886. Henry Moore, of New Windsor, Berks, dentist. A boot and shoe stud.

2887. William Klœn, of Birmingham, commercial traveller, and Daniel Jones, of Liverpool, photographic artist. An improvement or improvements in photography.

2888. Thomas Earp, of Newark, gentleman. An improved cutting apparatus for reaping and mowing machines.

2889. Alexander Grant, of Clement's-court, City, manufacturer. Improvements in shirts. A communication.

2890. Lodewyk Polak Kerdyk, of Manchester, chemist. Certain improvements in machinery or apparatus for extracting colouring matters to be employed for the purposes of dyeing, or for other similar processes.

2891. William Clyburn, of Lombard-street, City, merchant's clerk. Improved machinery for making butter.

2892. Heth Ogden, of Salford, Lancaster, engineer, and Henry Hibbert, of the same place, engineer. Improvements applicable to colliery and locomotive engines for the purpose of arresting or retarding their motion at required intervals, and of indicating the amount of work done in relation to such intervals.

Dated December 6, 1856.

2893. William Hooper and Joseph Fry, of Mitcham, Surrey, and George Nasmyth, of Bucklersbury, City. Improvements in springs for railway carriages, and for other purposes.

2895. William Stettinius Clark, of High Holborn, engineer. Improvements in combined caldron and furnace for agricultural and other purposes. A communication from H. Newsham, of Baltimore, U.S.

2897. James Perry, of Ballemoney, Ireland, manufacturing chemist. Improvements in the treatment, application, and use of mineral tar for the production of oleaginous and lubricating matter and fuel.

2899. John Horace Taylor, of Bunhill-row, Mid-

dlesex, engineer, and Philip Marcus, of Well-street, in the same county, tailor. An improvement in irons for ironing.

2901. Stephen Randoll Smith, of Bristol. Improvements in anchors.

Dated December 8, 1856.

2905. Richard Eaton, of Sussex-terrace, New-road, Battersea, engineer. An improvement in the manufacture of springs when India-rubber is used.

2907. James Bertram, of Edinburgh, engineer. Improvements in steam engines.

2909. Benjamin Carless, of Birmingham. An improved bird cage.

2911. Edward Burwell, of Gainsborough, Lincoln, coffee merchant. An improvement in roasters for coffee, cocoa, chicory, and similar substances.

Dated December 9, 1856.

2913. Joseph Lillie, of Manchester, engineer, and Arthur Dobson, of Belfast, bleacher and finisher. Improvements in machinery or apparatus to be used in the processes of drying animal, mineral, and vegetable substances.

2915. Thomas Vicars, sen., Thomas Vicars, jun., and Thomas Ashmore, all of Liverpool, engineers, and James Smith, of the same place, baker. Improvements in the manufacture of biscuits, lozenges, and other like articles of confectionery.

2917. John Rawson, of Bury, Lancaster, engraver. Improvements in lubricators.

2919. John Robinson Scartliff, of Wolverhampton, whitesmith and bellhanger. Improvements in apparatus to be employed as an alarm and detector in cases of burglary.

2921. William Seggie Carr, of New York, U.S. Improvements in water-closets.

2923. Hector Mollett, of Newlay, near Leeds, dyer. An improvement in fulling woven woollen fabrics.

2925. John Thornett, jun., of the New North-road, licensed victualler. Improvements in gas burners.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

2933. Louis Vignat, of Paris, merchant. A new slide beater with one or more shuttles applicable to any loom whatever for weaving all kinds of tissue. Dated 11th of December, 1856.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," December 23rd, 1856.*)

1863. S. King. Improvements in spirit lamps.

1888. N. D. Maillard. An improved mechanical and magnetic compass.

1895. R. D. Kay. Improvements in machinery or apparatus for washing, scouring, cleaning, preparing, dyeing, or finishing woven fabrics, yarns, or threads.

1897. J. B. Clara. Certain improvements in producing and employing steam and the gaseous products of combustion for obtaining motive power.

1905. P. A. Godefroy. An improved treatment of the matrix of rock, quartz, and all like substances, for the extraction of auriferous, argentiferous, and other metals contained therein.

1910. C. S. S. de Kis-Geresd. Improvements in obtaining motive power.

1911. C. R. Skinner. Certain improvements in tanning and finishing off leather.

1916. D. Chalmers. Improvements in looms for weaving.

1919. S. Lilley. Improvements in the manufacture of ships' iron-work, a part of which improvements is applicable to the manufacture of other articles in iron.

1925. W. E. Newton. Improved machinery for cutting and finishing metal screws.

1927. W. E. Newton. Improved machinery for forging or working iron and other metals.

1933. H. F. Osman. An improved electric clock. A communication.

1951. J. Hacking and W. Wheeler. Improvements in the mode or method of winding, warping, sizing, and beaming cotton, woollen, linen, or other yarns or threads, and in the machinery or apparatus employed therein.

1956. R. Kenton. A new or improved manufacture of fishing reels.

1966. E. Hallen. Improved means for washing wool.

2003. C. D. Gardissal. A mode of treating and preparing seaweeds or marine plants for manure. A communication.

2005. R. A. Brooman. Improvements in shuttles. A communication.

2010. J. Avery. Improvements in bellows.

2012. J. R. Sees. Improved apparatus for heating the feed water of steam boilers.

2075. J. Anelli. A crampon, to prevent horses slipping in frosty weather.

2107. C. W. Siemens. Improvements in electric telegraphs and apparatus. A communication.

2175. J. Barber. Improvements in machinery or apparatus for mill and other engraving, punching, dividing and ruling rollers either for hand or machine engraving, and an improved mandril used in mill, eccentric, and other machinery employed in engraving rollers for printing and embossing calicoes and other fabrics.

2186. L. Jacquemier. An improved method of hardening and colouring alabaster, and other gypsums and calcareous stones and earths.

2386. G. Heppell. Improvements in ventilating mines and other like places.

2408. E. Hallen. Improvements in the construction of chairs, sofas, bedsteads, and similar articles of furniture to sit or recline upon.

2562. H. Hutton. Improvements in lubricators.

2778. D. Chadwick. Improvements in apparatus for measuring water and other fluids and gas.

2785. C. J. Lewsey. Improvements in sugar-cane mills.

2789. J. Orr. Improvements in the manufacture of pile fabrics.

2798. A. V. Newton. Improved machinery for forging iron. A communication.

2828. L. C. Stuart. Improvements in machinery for reducing fibres to pulp.

2829. J. Brown. Improvements in the construction of the lower masts of ships.

2841. E. J. Emmons. A new or improved nursery chair.

2850. R. A. Brooman. Improvements in pumps and in pumping. A communication.

2854. L. D. Girard. Certain improvements in hydraulic turbines.

2860. J. H. B. Thwaites. An improved screw bolt or fastening for ship-building and other purposes.

2865. E. Rider. Improvements in the manufacture or treatment of gutta percha, being improvements upon the invention secured to him by letters patent dated the 20th day of July, 1852.

2868. H. G. Armourer. Improvements in firearms and ordnance, and of the cartridges or projectiles to be used therewith.

2877. L. C. Stuart. Improvements in drying sized paper.

2882. A. E. L. Bellford. Improvements in dry-

ing, burning, and cooling bricks, tiles, and other ceramic substances. A communication.

2884. D. Crawford. Improvements in washing, cleansing, and preparing textile fabrics and materials.

2897. J. Perry. Improvements in the treatment application, and use of mineral tar for the production of oleaginous and lubricating matter and fuel.

2905. R. Eaton. An improvement in the manufacture of springs when India-rubber is used.

2907. J. Bertram. Improvements in steam engines.

2933. L. Vignat. A new slide beater with one or more shuttles applicable to any loom whatever for weaving all kinds of tissue.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1853.
2937. Joseph Sharp Bailey.
2939. George Anderson.
2943. Isaac James.
2966. Gottlieb Boccius.
2985. Francis Bennoch.
3004. James Taylor.
3009. John Barnes.
3032. Alfred Vincent Newton.

LIST OF SEALED PATENTS.

1855. *Sealed December* 19, 1856.
1774. John Macintosh.
1856.
1441. George Tillett.
1443. Francis Gybbon Spilsbury.
1445. Theodore Schwartz.
1453. James Bullough.
1456. Michael Thomas Crofton.
1462. Elias Robison Handcock.
1465. William Valentine Miller.
1470. James Atkinson Longridge.
1471. George Riley.
1472. John Miller.
1476. Charles Mills.
1479. John Saxby.
1481. Joseph Harrison and Christopher Gelderd.
1499. James Kenyon and Richard Kenyon.
1511. William Hudson and Christopher Catlow.
1522. Bevan George Sloper.
1525. William McAdam.
1557. Thomas Emmanuel Marais.
1558. John Williamson and James Cochran Stevenson.
1567. Joseph Brown.
1573. John Henry Johnson.
1577. Joseph Adshead.
1585. Robert Millward.
1593. Henry Smith.
1607. Robert Martineau and Brooke Smith.
1649. William Petrie.
1679. Adolphus Frederick Gurlt.
1725. John Edward Hodges.
1740. Samuel Frédéric Berthiez.
2477. Alfred Vincent Newton.

Sealed December 22, 1856.
1240. John Dixon.

Sealed December 24, 1856.
1500. Louis Cornides.
1591. George Sampson.
1627. Richard Dugdale Kay.
1628. Robert Thomas Eadon.
1640. Thomas Charlton and William Turnbull.
1664. Arthur Neild.
1678. George Eskholme and Henry Wilkes.
1683. John Cartwright.
1704. William Stettinius Clark.
1728. Alfred Vincent Newton.
1736. John Imray.
1850. Augustus Pfaltz.
1890. Edwin Firth.
1902. Thomas Bilbe.
2131. Constant Jouffroy Duméry.
2132. William Stettinius Clark.
2199. Amos Hustler.
2220. Robert Mushet.
2224. Thomas Wallace.
2267. Frederick Ransome.
2319. George Fergusson Wilson and Alexander Isaac Austen.
2330. Maria Farina.
2333. John Gedge.
2348. George Fergusson Wilson.
2368. William Nairne.
2390. Gustav Scheurman.
2391. Leopold Ador and Edouard Abbadie.
2471. John Shaw.
2500. William Woodford.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
Nov. 28	3908	Cook, Rowley, and Co.	Golden-square	Brougham.
Dec. 2	3909	William Deller	67, Crooked-lane	Angler's winch-handle.
,,	3910	James Cooke	Birmingham	Timepiece-dial.
3	3911	H. J. and D. Nicoll	Regent-street	Mantle.
5	3912	William Palmer	Clerkenwell	Chimney for lamps.
6	3913	Samuel Griffiths	Wolverhampton	Mole-trap.
11	3914	Samuel Smith	Birmingham	Umbrella-rib.
12	3915	Albert Delfosse	St. Swithin's-lane	Anti-garrotte boot-bayonet.
15	3916	Samuel Unite	Birmingham	Spring-buckle.
16	3917	Theophilus Westhorpe.	Commercial-road	Anti-friction serving mallet.
,,	3918	James Parkes and Son.	Birmingham	Carpet-fastening.
17	3919	George John Calvert and Co.	York	Sawing & tenoning-machine.
,,	3920	Benjamin Wilson	Cheapside	Flexible felt banded hat.
22	3921	Dent, Alcroft, and Co.	Cheapside	Albany shirt.
,,	3922	James Buchanan, John Newark, and Joseph Sergeant Rock	Piccadilly and Coventry	Arrow-point.

PROVISIONAL REGISTRATIONS.

Nov. 27	817	John Drumgoole Brady	Bryanston-street	Knapsack.
29	818	Samuel Henry Sewers..	Somerset	Manure-distributor.
Dec. 1	819	Carrett, Marshall, and Co.	Leeds	Smoke-burning apparatus.
3	820	Benjamin Beard and Son	Colchester	Steamer.
8	821	William Sweetland	Somerset	Expression lever and key for an organ.
10	822	Charles Davis	Oxford-street	Metallic grooved wheel action.
11	823	William Charles Keller	Soho-square	Travelling bag-frame.
18	824	Cornelius Devonport...	Birmingham	Crystal Palace fountain-pen.
,,	825	Joshua Hodgkinson Williers	Birmingham	Safety-bolt.
,,	826	Samuel Kendall	Islington	Anti-garrotte.
,,	827	Robert Boswell	Islington	Stay-fastener.
,,	828	Robert Collins and William Yeoman	Finsbury	American three-fold portmanteau.
20	829	Edwin Kesterton	Long-acre	Sociable driving phaeton.
,,	830	James Buchanan, John Newark, and Joseph Sergeant Rock	Piccadilly and Coventry	Arrow-point.

NOTICE TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

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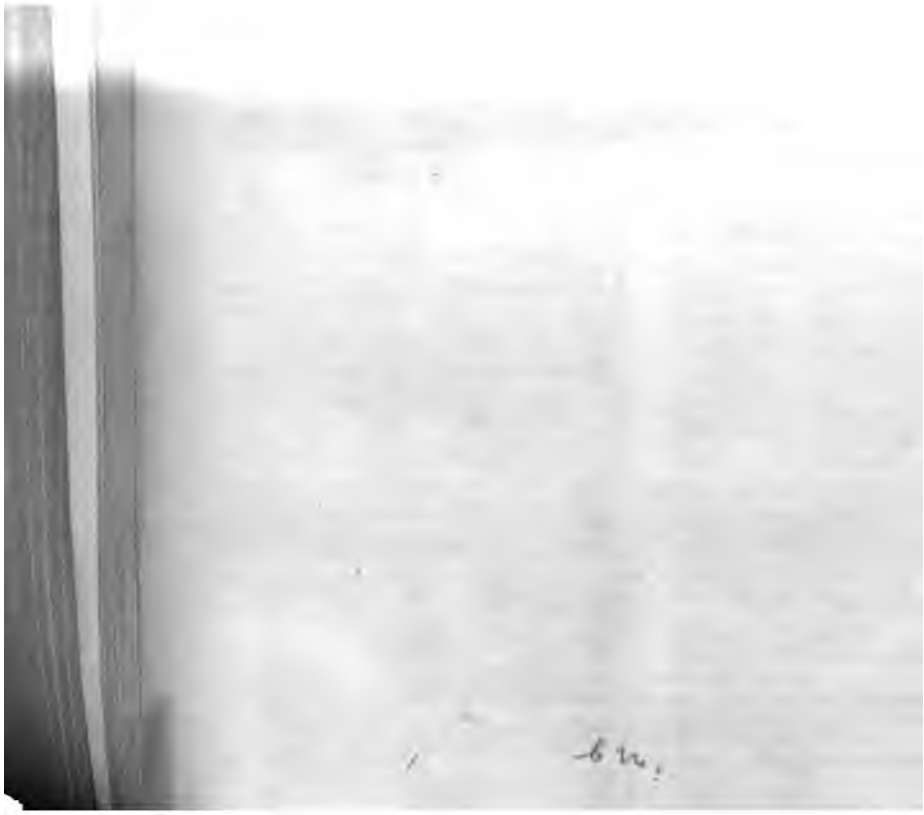
LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.